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EPA Region 5 Records Ctr.

POWER/CRSS

REPORT

Report of Environmental Investigation

Proposed Northwestern Memorial Hospital Facility Redevelopment Site Chicago, Illinois

STS Consultants Ltd. Consulting Engineers

LOG OF BORING NUMBER CLIENT B-101 Power/CRSS ARCHITECT-ENGINEER PROJECT NAME Ellerbe Beckett/HOK Northwestern Memorial Hospital STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH
TONS/FT. 2
1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois (PP.) PHOTO-IONIZATION DETECTOR READING (F LIGUID PLASTIC WATER LIMIT X CONTENT % UNIT DRY WT. LBS./FT.3 ELEVATION ×--- Δ SURFACE ELEVATION
SURFACE ELEVATION
Fill: Silty fine
Fill: Silty fine DESCRIPTION OF MATERIAL DEPTH (FT) 웆 10 30 STANDARD
PENETRATION BLOWS/FT.
20 30 40 50 ⊗ 10 Fill: Silty fine to medium sand, little gravel and brick, trace cinders and glass - gray and reddish brown - medium dense to loose - moist (SM) .⊗¹ª < 1 Щ SS ⊗. SS Fill: Silty clay, little brick, trace gravel and sand - gray and reddish brown (CL) ⊗ lss Fill: Cinders, little silt, gravel and sand, trace brick - black - loose - moist (SM) 46 Fill: Silty fine to medium sand, trace gravel and brick - brown to brownish gray ~ loose - moist (SM) 44 ₩10 < 1 SS Silty fine sand, little gravel - brown - dense - saturated (SM) AA \otimes < 1 SS RB < 1 SS Silty fine sand, trace clay, gravel and peat - dark gray and slightly black - dense -saturated (SM) ✌ 8 SS Note: Sample 8 - slightly organic. Silty clay, trace gravel, sand and snale - gray - medium to very stiff (CL) RB ST RB 10 ST RB 40.0 Calibrated Penetrometer ... continued STS JOB NO.27313 SHEET NO. 1 OF The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual,

CLIENT LOG OF BORING NUMBER B-101 Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd SITE LOCATION UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 1 2 3 4 5 Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois PHOTO-IONIZATION DETECTOR READING (R PLASTIC WATER LIQUID LIMIT X CONTENT X LIMIT X UNIT ORY WT. LBS./FT.3 **-** Δ DESCRIPTION OF MATERIAL DEPTH (FT) SAMPLE TYPE SAMPLE DISTAI RECOVERY 웆 SAMPLE STANDARD
PENETRATION BLOWS/FT.
20 30 40 50 ⊗ 10 SURFACE ELEVATION Continued from previous page 40.0 Silty clay, trace gravel, sand and shale - gray - medium to very stiff (CL) 11 ST RB 45.0 12 ST 105 RB 50.0 13 ST RB 55.0 14 ST RB 60.0 Silty clay, trace gravel, sand and shale - gray - stiff to very stiff (CL) ${\sf CL}$ 15 ST ЯB 65.0 *0 16 ST Silty fine to coarse sand, little gravel, trace clay - gray - moist (SM) 70.0 17 ST Silty clay, trace gravel, sand and shale – gray – very stiff to hard (CL) $\,$ 75.0 O_{*} 18 19 ST 80.0 Silty clay, trace gravel, sand and shale - gray - very stiff (CL-ML) Calibrated Penetrometer ... continued SHEET NO. 2 OF 3 STS JOB NO.27313 The stratification lines represent the approximate boundary lines between soil types; in-situ, the transition may be gradual.

CLIENT LOG OF BORING NUMBER B-101 Power/CRSS ARCHITECT-ENGINEER PROJECT NAME Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd UNCONFINED COMPRESSIVE STRENGTH TONS/FT.2 1 2 3 4 5 SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois (BE) PHOTO-IONIZATION DETECTOR READING (F LIQUID WATER DE DE SURFACE ELEVATION ELEVATION (FT) LIMIT X CONTENT % LINIT X / HT. DESCRIPTION OF MATERIAL DEPTH (FT DRY 1 LBS./F 웆 10 30 SAMPLE IIS STANDARD PENETRATION BLOWS/FT. 20 30 40 50 Continued from previous page 80.0 Silty clay, trace gravel, sand and shale - gray - very stiff (CL-ML) $\,$ ·O* *07 20 ST Silty clay, little sand, trace gravel and shale – gray – very stiff to hard (CL) $\,$ 128 21 ST **)***7∗ RB ○*7+ ST RB 130 123 ST RB 90.0 132 RB τ<mark>β</mark>0, e . *OK* 25 SS RB 95.0 *****O .183 26 SS RB \circ_* 27 SS 100.0 End of Boring Borehole grouted upon completion. Casing used: 30 ft. of 4 in Calibrated Penetrometer SS* = Standard penetration value based on first 6 inches of driving. The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual. STS OFFICE BORING STARTED WS OR WD Northbrook-01 BORING COMPLETED 07/13/92 29 ft STS JOB NO. 27313 WL APP'D BY MAK RIG/FOREMAN

CLIENT LOG OF BORING NUMBER B-102 Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Ellerbe Beckett/HOK Northwestern Memorial Hospital STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois PHOTO-IONIZATION DETECTOR READING LIQUID DISTANCE LIMIT X CONTENT X LIMIT X /FT.3 - - ∆ ELEVATION DESCRIPTION OF MATERIAL x - -DEPTH (FT) Ξ DRY 1 10 50 30 SAMPLE D SAMPLE II. STANDARD PENETRATION BLOWS/FT. 20 30 40 50 ⊗ 10 SURFACE ELEVATION PA Driller's observation: 3 in. asphalt, 9 in. stone $\otimes \mathcal{E}$ 1 SS <1 Fill: Silty fine to medium sand, little gravel, trace cinders - brown and reddish brown - loose to medium dense - moist (SM) Ø SS <1 PA • 🛭 < 1 3 SS Fill: Silt, fine to medium sand. little gravel, trace clay - orange-brown and slightly gray - extremely dense (SM)

Silty fine sand, trace clay and gravel - brown to brownish gray - extremely dense to dense - saturated (SM) < 1 ss | L < 1 5 SS РΔ 15.0 <1 6 SS RΒ <1 SS RB 8 <1 SS 8 Silty clay, trace gravel, sand and shale - gray - soft to stiff (CL) $\,$ RB ST 109 \mathcal{Q} 9 RB 35.0 110 Ø 10 ST RB 40.0 Calibrated Penetrometer ... continued STS JOB NO.27313 SHEET NO. 1 OF The stratification lines represent the approximate boundary lines between soil types:in-situ, the transition may be gradual.

B-102 CLIENT LOG OF BORING NUMBER Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Ellerbe Beckett/HOK Northwestern Memorial Hospital UNCONFINED COMPRESSIVE STRENGTH TONS/FT.2 1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois PHOTO-IONIZATION DETECTOR READING LIQUID DE SURFACE ELEVATION ELEVATION (FT) CONTENT X LIMIT X UNIT DAY WT. LBS. /FT. 3 - - ∆ DESCRIPTION OF MATERIAL **DEPTH (FT)** SAMPLE NO. 30 10 STANDARD PENETRATION BLOWS/FT. 20 30 40 50 Continued from previous page 40.0 Silty clay, trace gravel, sand and shale \neg gray \neg soft to stiff (CL) 112 969 11 ST RB 12 ST RB 50.0 13 ST RB Silty clay, trace gravel, sand and shale - gray - stiff to very stiff (CL) 14 ST RB 15 ST RB 16 ST RB 17 ST RB 18 19 ST 80.0 Calibrated Penetrometer ... continued SHEET NO. 2 OF 3 The stratification lines represent the approximate boundary lines between soil types:in-situ, the transition may be graduml. STS JOB NO.27313

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LOG OF BORING NUMBER B-102 CLIENT Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd UNCONFINED COMPRESSIVE STRENGTH TONS/FT.2 1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois (Hadd PHOTO-IONIZATION DETECTOR READING (F PLASTIC WATER OTHER 1 E TYPE DISTANCE CONTENT % LIMIT % LIMIT X IT ORY MT. LBS./FT.3 ELEVATION - Δ DEPTH (FT) DESCRIPTION OF MATERIAL 웆 10 50 SAMPLE DI RECOVERY LIN STANDARD PENETRATION BLOWS/FT. 20 30 40 50 ⊗ 10 SURFACE ELEVATION Continued from previous page 80.0 Silty clay, trace gravel, sand and shale - gray - stiff to very stiff (CL) 20 Clayey silt, little sand, trace gravel and shale – gray – hard (ML-CL) $\,$ Silty clay, little sand, trace gravel and shale - gray - very stiff to hard (CL) 134 Ó**()***7+ RB 0.2 ○○*7+ 130 RB **8**6⁄e-90.0 24 SS RB 25 SS RB **73** ⊗O*7+ 26 lss RB 27 SS 100.0 End of Boring Borehole grouted upon completion. Casing used: 30 ft. of 4 in. Calibrated Penetrometer The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual. BORING STARTED STS OFFICE WS OR WD 9 ft 07/14/92 Northbrook-01 SHEET NO. BORING COMPLETED 07/14/92 ENTERED BY BCR ACR 21 ft STS JOB NO. 27313 RIG/FOREMAN APP'D BY WL 8-61/DT

LOG OF BORING NUMBER CLIENT B-103 Power/CRSS ARCHITECT-ENGINEER PROJECT NAME Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois PHOTO-IONIZATION DETECTOR READING (P PLASTIC WATER LIQUID ELEVATION (FT) TYPE LIMIT X LIMIT % CONTENT % IT DRY WT. LBS./FT.3 - - A DESCRIPTION OF MATERIAL DEP1H (FT) 2 10 30 50 SAMPLE D RECOVERY SAMPLE I STANDARD PENETRATION BLOWS/FT. 20 30 40 50 ⊗ 10 SURFACE ELEVATION Driller's observation: 3 in. asphalt, 4 in. stone 1 SS Fill: Silty fine to medium sand, trace gravel, mortar, brick, cinders and miscellaneous rubble - dark grayish brown - medium dense to loose - moist (SM) 5 Q. 2 SS Fill: Cinders, trace sand and brick — black — loose — moist (SM) $^{\circ}$ ⊗.5 I 1 3 SS РΔ Fill: Broken concrete, little silt and sand - light gray - moist (GM) - 8 2 SS Possible fill: Fine sand, little silt, trace cinders - brown and slightly gray - dense - moist (SP) 5 SS 1 Silty fine sand, trace gravel - brown to brownish gray - dense - saturated (SM) PΔ < i 8 SS 6 RB <1 SS RB ı ⊗⁴3 SS <1 RB 30.0 <1 SS 9 Silty clay, trace gravel, sand and shale - gray - medium to stiff (CL) RB 35.0 109 10 ST RB 40.0 Calibrated Penetrometer ... continued SHEET NO. 1 OF 3 STS JOB NO.27313

CLIENT LOG OF BORING NUMBER B-103 Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Ellerbe Beckett/HOK Northwestern Memorial Hospital STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois PHOTO-IONIZATION DETECTOR READING WATER LIQUID LIMIT * LIMIT * CONTENT X RY NT. **ELEVATION** DESCRIPTION OF MATERIAL DEPTH (FT) DAY Y 皇 10 30 50 SURFACE ELEVATION SAMPLE STANDARD PENETRATION BLOWS/FT. 20 30 40 50 Ĭ ⊗ 10 Continued from previous page 40.0 Silty clay, trace gravel, sand and shale - gray - medium to stiff (CL) ST 11 RB 45.0 ST 12| RB 50.0 Silty clay, trace gravel, sand and shale - gray - stiff to very stiff (CL) 13 ST RB 14 ST RB 60.0 15 ST RB 65.0 16 ST Silty clay, trace gravel, sand and shale - gray - stiff to hard (CL) $\,$ 70.0 ST Note: Sample 19-irregular sand lenses. 17 RR 18 ST 19 ST Silty clay, trace gravel, sand and shale - gray ---very stiff [CL] * Calibrated Penetrdmeter ... continued STS JOB NO.27313 SHEET NO. 2 OF The stratification lines represent the approximate boundary lines between soil types:in-situ, the transition may be gradual.

CLIENT LOG OF BORING NUMBER B-103 POWER/CRSS														
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STS Cons				1.	Northwestern Mei	morial Hospital	E11	lerbe	Becke	tt/HOK	CONETNED	COMPONE	THE CTO	ENCTU
SITE L Grand				s/	Illinois/McClurg	Ct.: Chicago, Illinois			Ŷ		CONFINED (3 3		5
DEPTH (FT) ELEVATION (FT)	SAMPLE NO.	PLE TYPE	PLE DISTANCE	OVERY	DE SURFACE ELEVATION	ESCRIPTION OF MATERIAL		UNIT DRY WT. LBS./FT.3	PHOTO-IONIZATION DETECTOR READING (PPM)	PLASTI LIMIT X 10	X CON	ATER TENT X	40 5	Δ Δ 0
	SAM	SAH	S		SURFACE ELEVATION			3	표임	⊗ 10	PENETH 20	30	BLOWS/F	T. 0
80.0					Continued from p									
	50	ST			Silty clay, trac very stiff (CL),	ce gravel, sand and shale -	gray -				•	/ 0*		
	21	RB ST		T										
85.0	-	RB	╁	Ħ							1			
	22	ST		Ц							****	*	1	
	23	ST	П	Ħ	Silty clay - gra	ay - very stiff to medium (C	CL-CH)			C	A0	1		
90.0		RB	Ш	╣						*	/ *	1		
	24	ST	\prod	П						**	. •			
	=	8	H	∄	Clavey silt tr	ace gravel, sand and shale		 		* \	1	+	-	
	25	ST			- gray - stiff	ace gravel, sand and snale (ML-CL)				" Φ`	\Q 4			
95.0	26	57		Ħ	Silty clay, some	e sand, trace gravel and sha to hard (CL)	ile.	 	 			₽ *	 	
		RB				to naro (CL) Boulders or obstructions fr				;	· **		1	
	27	SI	H	폭	95.5 to 96 ft. Sample 27 - bad		•	1			•	, O-	T	 - 0*
100:0		RB		\downarrow					}					
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105.0				+	End of Boring	d upon completion.	-	 				+	*	
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		īħ	e si	rai	tification lines repre	sent the approximate boundary lim	nes between	soil t	ypes: in	-situ, ti	ne transit	ion may	be gra	dual.
WL			1	4	WS OR WD	BORING STARTED 07/15/92		ST	OFFIC		Northbro	nok-01		
WL			_	ВС		BORING COMPLETED 07/15/92		EN	TERED B		SHEET N	0.30	F 3	
WL		•			· -···-	RIG/FOREMAN B-61/DT			P'D BY		STS JOB			
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LOG OF BORING NUMBER B-104 CLIENT Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois PHOTO-IONIZATION DETECTOR READING (WATER LICUID TYPE DISTANCE CONTENT X LIMIT LIMIT X LIMIT X ELEVATION Y WT /FT. ×---DESCRIPTION OF MATERIAL **DEPTH (FT)** LBS. 2 10 50 30 SAMPLE TO SAMPLE DI RECOVERY SAMPLE E E STANDARD PENETRATION BLOWS/FT. 20 30 40 50 8 SURFACE ELEVATION Driller's observation: 2 in. asphalt, 2 in. crushed stone fill PA 8 1 1 SS Fill: Cinders, some brick, little sand - dark gray and reddish brown - medium dense - moist (SM) 1 SS ⊗ Fill: Silty fine to medium sand, little clay, trace gravel, cinders and glass - brownish gray medium dense - moist (SM) 5.0 Fill: Silty clay, little sand and brick, trace gravel and cinders - grayish brown - medium (CL)
Fill: Silty fine to medium sand, little wood, trace clay, brick, cinders and mortar - brownish gray - loose - moist (SM) & SS 1 3 ⊗. 1 SS Silty fine sand, some gravel - brown - dense - moist (SM) PA 10.0 1 SS Silty fine to very fine sand, trace gravel - brown to gray - dense - saturated (SM) 15.0 . ⊗49 SS 6 <1 RB 20.0 8 SS RB 8 <1 SS 8 30.0 8 < 1 SS 9 Silty clay, trace gravel, sand and shale – gray – medium to very stiff (CL) $\,$ RB <u>35.0</u> 10 ST 108 *8 <u> 1045T</u> RB 40.0 Calibrated Penetrometer ... continued The stratification lines represent the approximate boundary lines between soil types:in-situ, the transition may be gradual. STS JOB NO.27313 SHEET NO. 1 OF

LOG OF BORING NUMBER B-104 CLIENT Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Ellerbe Beckett/HOK Northwestern Memorial Hospital STS Consultants Ltd - UNCONFINED COMPRESSIVE STRENGTH SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois PHOTO-IONIZATION DETECTOR READING (P LIQUID ELEVATION (FT) DISTANCE LIMIT X CONTENT X LIMIT * AY MT. - - A DESCRIPTION OF MATERIAL 0EPTH (FT) LBS./ 웆 20 30 SURFACE ELEVATION SAMPLE SAMPLE Ĭ STANDARO PENETRATION BLOWS/FT. 20 30 40 50 8 Continued from previous page 40.0 Silty clay, trace gravel, sand and shale - gray - medium to very,stiff (CL) 11 ST RB 45.0 12 ST RB Clayey silt, little sand, trace gravel - gray - moist (ML-CL) Silty fine sand, little clay - gray - moist to wet (SM) 144ST Note: Irregular clay lenses. 148 ST Clayey silt, trace gravel, sand and shale - gray - hard - moist (ML-CL) Silty clay, trace gravel, sand and shale - gray - very Stiff to stiff (CL) RB 60.0 - 15 | ST Silty clay, trace gravel, sand and shale - gray - soft (CL) $\,$ RB Note: Sample 16 - unit dry weight * 113 pcf. 65.0 113 ⊒16 |ST Silty clay, trace gravel, sand and shale - gray - nard (CL) $\,$ 17 ST Note: Sample 18 - irregular sand seam. RB ST 18 Clayey silt, trace gravel, sand and shale - gray - hard (ML-CL) **)***7+ 19 ST 80.0 Silty clay, little sand, trace gravel and shale `- gray (CL) Calibrated Penetrometer ... continued STS JOB NO.27313 SHEET NO. 2 OF 3 The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

LOG OF BORING NUMBER B-104 CLIENT Power/CRSS ARCHITECT-ENGINEER PROJECT NAME Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois PHOTO-IONIZATION DETECTOR READING (P WATER LIQUID ELEVATION (FT) TYPE LIMIT X LIMIT X CONTENT X DAY WT. RS. /FT. 3 DESCRIPTION OF MATERIAL × - -**DEPTH (FT)** F 욧 HANGE ELEVATION 10 20 30 50 LBS. SAMPLE STANDARD
PENETRATION BLOWS/FT.
30 40 50 TIN5 ⊗ Continued from previous page 80.0 Silty clay, little sand, trace gravel and shale - gray (CL)
Silt, little clay, trace gravel, sand and shale - gray - moist (ML) 131 20 51 11 σ 20AST 6-8 *7+ 130 Q Silty clay, little sand, trace gravel and shale - gray - very stiff to hard (CL) ST 85.0 131 22 ST | [] ÖO*7+ RB).6 ○○>#7+ 129 RB 90.0 O*****74 RB * SS RB RB <u>¹</u>₿6*₄ 27 SS 100.0 End of Boring Borehole grouted upon completion. Casing used 30 ft. of 4 in. Calibrated Penetrometer The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual. STS OFFICE WL WS OR WD BORING STARTED 07/16/92 13.5 ft Northbrook-01 BORING COMPLETED 07/16/92 BCR ENTERED BY WL ACR SHEET NO. STS JOB NO. 27313 WL RIG/FOREMAN APP'D BY B-61/DT MAK

LOG OF BORING NUMBER B-105 CLIENT Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 1 2 3 4 5 SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois PHOTO-IONIZATION DETECTOR READING (P LIQUID PLASTIC WATER DE STREET LAND CONTRACT CONTRA LIMIT % LIMIT % UNIT DRY WT. LBS./FT.3 ELEVATION DEPTH (FT) DESCRIPTION OF MATERIAL 皇 10 20 30 SAMPLE STANDARD PENETRATION BLOWS/FT. 20 30 40 50 **⊗** Fill: Silty clay, trace gravel, sand, topsoil, cinders and brick - brown and slightly black - very stiff (CL)

Fill: Silty fine sand, trace gravel, brick cinders and mortar - brown and slightly black - medium dense - moist to wet (SM) PA IA SS III 6/6 SS | < 1 PA 5.0 Note: Sample 3 - little topsoil. <1 SS <1 SS 10.0 Silty fine to medium sand, trace gravel – brown – saturated (SM) $\,$ < 1 SS Silty fine sand, trace gravel - brown to gray + saturated (SM) 15.0 < 1 16 55 RB S\$ <1 RВ SS 8 Silty fine sand, little clay, trace gravel and coarse sand - gray - saturated (SM) 30.0 < i 55 Silty clay, trace gravel, sand and shale - gray - medium to soft (CL) RB 35.0 108 10 ST Field vane at 37.5 ft. ₽B $s_u = 1264 \text{ psf}$ 40.0 Calibrated Penetrometer ... continued STS JOB NO.27313 SHEET NO. 1 OF 3 The stratification lines represent the approximate boundary lines between soil types:in-situ, the transition may be gradual.

CLIENT LOG OF BORING NUMBER B-105 Power/CRSS ARCHITECT-ENGINEER PROJECT NAME Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² 1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois PHOTO-IONIZATION DETECTOR READING (F PLASTIC WATER LIQUID ELEVATION (FT) SAMPLE TYPE SAMPLE DISTANCE RECOVERY LIMIT % CONTENT X LIMIT X 11 ORY NT. LBS./FT.³ (FT) ×---DESCRIPTION OF MATERIAL - - ∆ TYPE 2 30 SAMPLE ĭ STANDARD PENETRATION BLOWS/FT. 20 30 40 50 ⊗ 10 SURFACE ELEVATION Continued from previous page 40.0 Silty clay, trace gravel, sand and snale - gray - medium to soft (CL) RB SS 11 105 12 ST RB 50.0 Silty clay, trace gravel, sand and shale - gray - medium to very stiff (CL) 13 ST RB 14 ST RB 60.0 15 ST RB 65:0 16 ST Silty clay, little sand, trace gravel and shale - gray - very stiff to hard (CL) 129 **,**O 17 ST RB 75.0 18 ST 19 ST 80.0 Silty clay, trace gravel, sand and shale - gray ---very stiff to stiff (CL) Calibrated Penetrometer ... continued sts JOB NO.27313 SHEET NO. 2 OF The stratification lines represent the approximate boundary lines between soil types:in-situ, the transition may be gradual.

LOG OF BORING NUMBER B-105 CLIENT Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² 1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois ædd. PHOTO-IONIZATION DETECTOR READING (F LIQUID PLASTIC WATER ELEVATION (FT) THE DISTANCE PLEVATION LIMIT % CONTENT % LIMIT % IT DRY WT. LBS./FT.3 - - <u></u> DESCRIPTION OF MATERIAL **DEPTH (FT)** 2 10 50 SAMPLE III STANDARD PENETRATION BLOWS/FT. 20 30 40 50 8 Continued from previous page 80.0 Silty clay, trace gravel, sand and shale - gray - very stiff to stiff (CL) 20 ST AB 21 ST 85.0 Silty clay, trace gravel, sand and shale - gray - very soft to medium (CL) $\,$ 108 SOO. 22 85 23 ST Silty clay, trace gravel, sand and shale – gray – very stiff to medium (CL) $\,$ ST 24 ST 25 Silty clay, little sand, trace gravel and shale - gray - hard (CL) Н O*****7+ 26 ST RB 1 00*74 SS 27 100.0 End of Boring Borehole grouted upon completion. Casing used: 40 ft. of 4 in. Calibrated Penetrometer The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual. BORING STARTED 07/17/92 STS OFFICE WS OR WD Northbrook-01 SHEET NO. 3 BORING COMPLETED 07/17/92 BCR ENTERED BY OF 12 ft RIG/FOREMAN APP'D BY STS JOB NO. 27313 B-61/0T MAK

CLIENT LOG OF BORING NUMBER B-106 Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois <u>₹</u> PHOTO-IONIZATION DETECTOR READING (PLASTIC WATER LIQUID SAMPLE DISTANCE RECOVERY LIMIT X LIMIT X CONTENT % UNIT DRY WT. LBS./FT.3 ELEVATION ×--DESCRIPTION OF MATERIAL **DEPTH (FT)** 웆 10 30 SAMPLE STANDARD PENETRATION BLOWS/FT. 20 30 40 50 8 SURFACE ELEVATION Oriller's observation: 2 in. asphalt Fill: Cinders, little sand, trace brick - and dark brown - medium dense - moist (SM) 2 SS 2 2 SS RB 3 SS Silty fine sand - brown - very dense to dense - saturated (SM) $\,$ RB SS RB 15.0 <1 5 SS RB 20.0 <1 SS RB 8€ <1 SS Silty very fine sand, little fine gravel, trace clay - brown and gray - dense - saturated (SM-ML) 15/6 ° ⊗ 16/6 30.0 SS Silty fine to coarse sand, little fine gravel - brown and gray - saturated (SM) Ø RB Silty clay, trace gravel, sand and shale – gray – medium (CL) $\,$ 35.0 108 α 9 ST Field vane at 37.5 ft. RB $s_u = 1374 \text{ psf}$ 40.0 Calibrated Penetrometer ... continued STS JOB NO.27313 SHEET NO. 1 OF 3 The stratification lines represent the approximate by

LOG OF BORING NUMBER B-106 CLIENT Power/CRSS ARCHITECT-ENGINEER PROJECT NAME Northwestern Memorial Hospital Ellerbe Beckett/HOK UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois (PPM) PHOTO-IONIZATION DETECTOR READING LIQUID SAMPLE DISTANCE ETENATION

SAMPLE DISTANCE ETENATION ELEVATION (FT) CONTENT X LIMIT X LIHIT * IT DRY WT. LBS./FT.3 - - A × - -DESCRIPTION OF MATERIAL DEPTH (FT) 10 30 LINS STANDARD PENETRATION BLOWS/FT. 20 30 40 50 **⊗** Continued from previous page Silty clay, trace gravel, sand and shale - gray - medium (CL) 106 10 ST Field vane at 42.5 ft. RB $s_u = 1319 psf$ 45.Û ST 108 11 Field vane at 47.5 ft. RB $s_u = 1066 \text{ psf}$ 50.0 12 ST 107 RB * 13 ST 106 Silty clay, trace gravel, sand and shale - gray - stiff (CL) RB 60.0 14 ST BB Silty clay, trace gravel, sand and shale - gray - very stiff to hard (CL)15 ST RB 70.0 0* ST 16 RB **.**o-123 17 ST 112 18 ST 80.0 Calibrated Penetrometer ... continued STS JOB NO.27313 SHEET NO. 2 OF 3 dary lines between soil types; in-situ, the transition may be gradual.

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Landa, Jan.

LOG OF BORING NUMBER CLIENT B-106 Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois 5 PHOTO-IONIZATION DETECTOR READING PLASTIC LIQUID (FT) LIMIT X LIMIT % CONTENT % T ORY WT. LBS./FT.3 ELEVATION DESCRIPTION OF MATERIAL × - -DEPTH (FT) 2 10 20 30 50 SAMPLE STANDARD PENETRATION BLOWS/FT. 20 30 40 50 ij ⊗ 10 Continued from previous page 80.0 Silty clay, trace gravel, sand and shale - gray - very stiff to hard (CL) 19 ST Clayey silt, little sand, trace gravel – gray – moist (ML) $\,$ 20 Silty clay, little sand, trace gravel and shale - gray - hard (CL) 85.0 131 21 ST RB 132 O*****7+ RB RB ⋪* RB 95.0 **₩**7+ 25 SS RB 109 ○*7+ 26 | 55 100.0 End of Boring Borehole grouted upon completion. Casing used 35 ft. of 4 in. Calibrated Penetrometer The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual. BORING STARTED 07/17/92 STS OFFICE WL WS OR WD Northbrook-01 SHEET NO. BORING COMPLETED 07/22/92 WL BCR ACR ENTERED BY OF RIG/FOREMAN APP'D BY STS JOB NO. 27313 B-61/DT

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1				CLIENT		LOG OF B	SOHING N	DWRFH	B-107	,	
	•	7		POWER/CRSS							
	<u> </u>			PROJECT NAME		ARCHITEC	T-ENGIN	EER			
STS Con	eul+	- ante	1+4	Northwestern Me	morial Hospital	Elleri	be Becke	tt HOK			
SITE			-	٠				-O- UN	CONFINED COM	PRESSIVE STRE	ENGTH
				s/Illinois/McClurg	Ct.; Chicago, Illinois	•		10	NS/FT. ²	4 5	5
		. —					PHOTO-IONIZATION DETECTOR READING (PPM)				
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DEPTH (FT) ELEVATION (FT)	SAMPLE NO	SAMPLE TYPE	إرا	SURFACE ELEVATION			5 3		STANDARD		
	3	불		SUBFACE FLEVATION				⊗	PENETRAT	ION BLOWS/FT	
Δ	S.	PA	S					10	20 30	40 50	0
				Asphalt – grav			14.2	\otimes			
	1	SS	П	Sand and rubbl	le fill, trace to little br	icks.		~		1 1	
	<u> </u>	├—	╂╂	sand, gravel,	wood and cinders - brownish	h gray -		ر ا	.		
	2	ss		mealum dense -	- moist (Rubble fill)		1.2	l &Σ.			
			Ш	<u> </u>						1 1	
5.0	-	PA	1	H			1	E.		1 1	
\vdash	3	SS	Ш				0.2	8	·• [1
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	Ι	PA	+++	Fine to medium	sand, little silt, trace	nravel	+	 	, 20 		
	4	SS		Lubple and mod	m senu, ilicie sili, crace (od - grav and dark orav - mi	gravel, edium	21.2		\$€0	1 1	1
10.0	 	PA	쌰	dense - moist	od – gray and dark gray – mi and saturated (Fill – SM)			1	'"•	··]	1
10.0				П			1		1 1	[]	55ـ
	5	SS		Note: Strong p	etroleum odor between 7.5 -	- 14.5 ft	14.0				∵⊗ ¯
	-	PA	╨	4					1 1		,- L
			\Box	7				1	l l	40	i i
	6	SS	Ш				14.1	1 1	1 1	❤	ı
15.0		PA	Н	Fano send like	ile silk toos servel and	<u> </u>	 -	┝┈╌┼		 -	
			П		tle silt, trace gravel and n - dense - saturated (SM)	2019162	2.0		1 1	1 1	Ø
	7	SS	H	- gray and car	i - dense - sacuraced (SM)			[1	1 1	
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	10	SS	\prod	1212.2120 (02)				[İ
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37.0	+	 	╀╀	End of De-/	· · · · · · · · · · · · · · · · · · ·			 - -			
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<u> </u>		106	5 t	acification lines repre	sent the approximate boundary lines	Detween Sol	ıı types: ir	1-51tu, tl	ne transition	n may be grad	na t ·
WL				WS OR WD	BORING STARTED		STS OFFI	Œ			
L			_13	3.5 ft WS	07/22/92				Northbrook	k-01	
ЖL				BCR ACR	BORING COMPLETED 07/22/92		ENTERED E	3Y	SHEET NO.	OF ,	
					07/22/92						
WL 40	£ 1	ΑD		•	RIG/FOREMAN		APP'D BY		STS JOB NO	1. 17212-YU	
1 10	ft	Αb			DR-9/Deon/Dumas		DLG		1 6	27313-XH	

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		CLIENT POWER/CRSS		LOG OF B	ORING N	JMBER	В	-108						
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ן נ		-			PROJECT NAME	enini Herrikai	ARCHITEC							
STS Cor				d .	Northwestern Men	orial Hospital	Eller	be Becke						
SITE Gran				s/	'Illinois/McClurg	Ct.; Chicago, Illinois			ONU O	ONFIN NS/FT. 2	ED COMP	PRESSIV	VE STREE	- 1
DEPTH (FT) ELEVATION (FT)	SAMPLE NO.	E TYPE	SAMPLE DISTANCE	RECOVERY	DE	SCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPM)	PLASTIC LIMIT : X -	<u>50</u>	30		LIQUI LIMI 2	Δ *
K~~	듗	SAMPLE	J.	ន	SURFACE ELEVATION			─ │₹ 🗒	⊗ 10	ST PE	ANDARD NETRATI	ON BL		
\sim	Ŝ	PA	S	트					10	20	30	40	50	
		1	1	T	Asphalt - grave			0.6	Ø	1				\neg
	2	SS			miscellaneous d	s, little to trace sand, g debris and wood – brown ar m dense – desiccated and m	id gray -	0.0	8					
5.0	3	SS PA			,			1.2	8					
	4	SS	\prod					0.4	⊗.7					
10-0	4A	SS	Щ	Ш	Fine sand, lit	tle silt, trace gravel - t moist to saturated (Fill	LOMU -	0.0	1.0	8	$\neg \top$	T	Ţ	
10.0	5	SS			Note: Strong po 11 and 1	etroleum odor and staining 5 ft.) between	0.1	8	•				
15.0	6	SS		\prod		-6 retained for chemical (20.9			⊗25			
13.0	7	ss		Ι	Fine sand, lit medium dense -	tle silt, trace gravel - (saturated (SM)]ray -	0.2		8		ļ		
		PA	Ļ	L					1	ſ	⊗ 2 6	ł		Į
	8	ss	Щ.	Щ				0.0			<u>⊗</u>]			
20.0	‡_	-	Щ.	ļ.	End of Boring	ed upon completion.		}	1	1	j		i	1
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		Th	e s	tra	atification lines repre	sent the approximate boundary line	es between so	il types: 1	n-situ, ti	ne tra	ansitio	n may	be grad	lual.
WL			•		WS OR WD .5 ft WS	BORING STARTED 07/23/92		STS OFFI		Nort	hbrool	k-01		
WL				В	CR ACR	BORING COMPLETED 07/23/92		ENTERED MG		<u> </u>	JOB NO		1	
1 1 1	1 ft AB RIG/FOREMAN DR-9/Mike/Dumas									1 313	JUD NU	, 27313	-XH	

Ca	CLIENT POWER/CRSS		LOG OF BO	RING NU	IMBER	B-109	
	PROJECT NAME	· · · · · · · · · · · · · · · · · · ·	ARCHITECT	-ENGINE	ER		
STS Consultants Ltd.	Northwestern Mei	morial Hospital	Ellerbe	e Becke	tt HOK		
SITE LOCATION	4		-		-O- UNCON		SSIVE STRENGTH
Grand/Columbus	/Illinois/McClurg	Ct.; Chicago, Illinois			1	2 3	4 5
SAMPLE NO. SAMPLE TYPE SAMPLE DISTANCE SAMPLE TYPE SAMPLE DISTANCE	DE	ESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPM)	PLASTIC LIMIT X X	CONTENT X	LIQUID
SAN SAN SAN SAN SAN SAN SAN SAN SAN SAN	SURFACE ELEVATION			그 돛 땀	⊗ 10	PENETRATION 20 30	BLOWS/FT. 40 50
PA	Asphalt - grav	el subbase					ŤŤ
1 SS]	Cinders, brick	s, wood, peat, sand and gr rk gray - loose to medium	avel dense -	70.9	⊗ ^B		
3 \$\$				20.1	⊗ .	5	
3A SS 4 SS 1	- brown and da - moist to sat	sand, little silt, trace rk gray - medium dense to urated (Fill - SM)	dense .	50.2	8		
10.0 PA 5 SS PA	1 staining	o strong petroleum odor and between 6 and 16 ft5 and S-6 retained for cl		60.2		⊗32	
6 SS	7			60.2			3
15.0 PA	_			00.2	ļ		1 1
7 SS				30.1	₩		
7A SS []		e sand, trace silt - brown		1.0	3,	31	
PA	mealum dense t	o dense - saturated (SM-S)	N ;	0.0			⊗³
8 SS ¹		•		10.0		'	~
20.0	End of Boring						
	Borehole grout	ed upon completion.					
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The str	atification lines repre	sent the approximate boundary line	s between soil	types: in	-situ, the	transition m	ay be gradual.
WL 14	WS OR WD	BORING STARTED 07/23/92	S	TS OFFIC		rthbrook-(01
	OCR ACR	BORING COMPLETED 07/23/92	E	NTERED B		HEET NO.	OF
WL	· · · · · · · · · · · · · · · · · · ·	RIG/FOREMAN		MG BY		TS JOB NO.	1
1 -		DR-9/Mike/Dumas	. 17	חום.	1		113-XH

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GR			_	CLIENT POWER/CRSS	LOG OF BOI	RING N	UMBER	. [3-11	.0		
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	▲ `	-		PROJECT NAME	ARCHITECT			N/				- 1
STS Consu		_		Northwestern Memorial Hospital	Ellerbe	Becke						
SITE LO Grand/	Co:	l I OI	N bus	/Illinois/McClurg Ct.; Chicago, Illinoi	ss	Î	_	TONS/F	T. 2	OMPRESS 3		ENGTH 5
DEPTH (FT) ELEVATION (FT)	E NO.	SAMPLE TYPE	E DISTANCE	DESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPM)	LIM)	<	CONT	TER ENT X		итх 📗
	SAMPLE	<u> </u>		CHREACE ELEVATION		- 15 E	(X) F	TANDAR	TION B	LOWS/F	
	<u>s</u>	A C	3 6	SURFACE ELEVATION		1 2	1	0 z	20 :	30 4	10 5	•
	$\neg \tau$		Ш	Asphalt - gravel subbase		0.2		$^{\alpha}$	7	1		
	+	55	H	Bricks, cinders, sand, gravel and w medium dense - gray and dark gray - (Aubble fill)	moist	0.0		₩	ĺ			
5.0	-	A A	Ľ	·			_					
3		SS	Щ	,		0.2	⊗		į			
4	5	55				0.0		⊗¹².	·			
5		SS		Fine to medium sand, trace silt and - gray - dense - wet and saturated Note: Sample S-6 retained for analy	gravel (Fill - SM) tical testing.	0.0				⊗3€		
6		SS			• •	0.0]	⊗³ ⊗³	P	
15.0 7	$\neg au$	SS S	+			0.0						55
		PA	Ц									8
8	-+	55	П			0.0		ļ				
20.0	- `	-	4	End of Boring			ļ	<u> </u>	ļ	 		
				Barehole grouted upon completion.								
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The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.												
WL			13	.5 ft WS DRING STARTED 07/23/92	S	TS OFFI	CE	Nort	thbro	ok-01		-
WL				BORING COMPLETED 07/23/92		NTERED I	ЭҮ		ET NO	1	1	
WL				RIG/FOREMAN DR-9/Mike/	DumasA	PP'D BY		STS	SJOB	NO. 27313	3- <u>XH</u>	

CLIENT LOG OF BORING NUMBER B-111 POWER/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett HOK STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH SITE LOCATION TONS/FT.2 Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois 5 PHOTO-IONIZATION DETECTOR READING (PPM) WATER LIQUID FT LIMIT X LIMIT X CONTENT % - - <u>\(\(\) \</u> ELEVATION × - -DESCRIPTION OF MATERIAL DEPTH (FT) 욧 10 SAMPLE DI PECOVERY SAMPLE SAMPLE STANDARD PENETRATION BLOWS/FT. 20 30 40 50 ⊗ 10 SURFACE ELEVATION Asphalt - gravel subbase Fill: Bricks, cinders, sand, gravel, wood, miscellaneous debris and clay - brown, black and gray - medium dense to dense (Rubble fill) 0.0 SS 0.0 2 SS 0.0 3 SS \otimes^{33} SS 0.0 50/6 Fine to coarse sand, trace silt and gravel – brown and gray – dense to very dense – wet to saturated (Fill – SM) 0.0 SS Note: Faint petroleum product odor between 12.5 and 17 ft. 0.0 SS 6 15.0 **35** 0.0 SS PA SS . Ø 8 0.0 20.0 End of Boring Borehole grouted upon completion. The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual. WS OR WD BORING STARTED 07/24/92 STS OFFICE 13 ft Northbrook-01 BCR BORING COMPLETED 07/24/92 ENTERED BY WL SHEET NO. STS JOB NO. 27313-XH WL RIG/FOREMAN APP'D BY DR-9/Deon/KEK DLG

CLIENT LOG OF BORING NUMBER B-112 POWER/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett HOK STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois (PPM) PHOTO-IONIZATION DETECTOR READING (F LIQUID DE SURFACE ELEVATION CONTENT X LIMIT % LIMIT X ELEVATION (- Δ x - -DEPTH (FT) DESCRIPTION OF MATERIAL ž 10 30 STANDARD PENETRATION BLOWS/FT. 20 30 40 50 ⊗ 10 Asphalt - gravel subbase underlain by concrete (augered) - desiccated (Fill) PA Fill: Cinders, brick, sand and gravel - brown and gray - medium dense (Rubble fill) ⊗14 ss 0.0 2 ⊗**1**9 5.0 0.0 3 SS Fine to coarse sand, trace silt and gravel - gray - dense - moist (Fill - SM - SP) 0.0 4 SS Note: Gravel lens at 11.5 ft. Petroleum product odor between 7.5 and 12.0 ft. 10.0 ∵⊗<mark>‡</mark>8 0.0 5 SS medium to coarse sand, trace silt and gravel - brown - dense to very dense - saturated (SP) **⊗**⁴⁴ 0.0 SS 6 15.0 \$50 7 SS 0.0 PA 85 В 55 0.0 20:0 End of Boring Borehole grouted upon completion. The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual. BORING STARTED 07/24/92 WS OR WD STS OFFICE 14.5 ft Northbrook-01 BORING COMPLETED 07/24/92 ENTERED BY WL BCR SHEET NO. RIG/FOREMAN APP'D BY STS JOB NO. 27313-XH DR-9/Deon/KEK

C	CLIENT LOG OF				BORING N	JMBEF	? (B-11	3			
			PROJECT NAME		ARCHITE	CT-ENGIN	EER					
STS Consult	⊾ tants	Ltd.	Nonth works to	morial Hospital		rbe Becke		OK				
SITE LOC	ATIO	N		·	L		ক	UNCONF	INED CO	MPRESS	IVE STE	RENGTH
Grand/C	olum	bus	/Illinois/McClurg	Ct.; Chicago, Illinois		₹		TONS/F	2 ;	3	4	5
DEPTH (FT) ELEVATION (FT) PLE NO.	SAMPLE TYPE	E DISTANCE	Di	ESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPM)			20 3	O 4		UID MIT X Δ
SAMPLE SAMPLE	[<u>E</u> [CUREACE ELEVATION				[⊗ ı	STANDAR! PENETRA	TION E	BLOWS/F	
N S	100	3 2	SURFACE ELEVATION				 	10 8	20 3	0 4	10 5	50
	PA	+	Asphalt - grav				├	+	<u> </u>			
1 2	SS SS		↓ and clay - bro	bricks, wood chips, so wn and black - medium (oist (Rubble fill)	dense to	0.0		⊗'				**
5.0	SS PA		Modaum to coop		t enaval	3-5		₩3				
10.0	SS		- black and gr and saturated	se sand, trace silt and ay - dense to very dense (Fill - SP)	se - moist	5-7		⊗.4		ļ ,	8	
5	SS		7 and 18	etroleum odor and stain ft.	iing between	į				∵⊗		50
□ 6	SS					2.0			}	1	'	X
15.0	PA	111					i		,			
<u></u>	SS	Ш				8.0		İ				(S)
	58		1			5.0					1 3	5/6
8 8A	T I	╁┼╂	Fine to medium	sand, trace silt and	gravel		\vdash	+	 	_	· · · · ·	**************************************
20.0	PA	Щ	- brownish gra	y - very dense to extr - SP)	dense -							
9	SS	Ш	saturated (SM	- 591		0.2-						85
22.0	100	Щ									<u> </u>	\coprod
			End of Boring	ed upon completion.								
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	The	stra	atification lines repre	sent the approximate boundary	lines between so	i) types: ir	1-situ	, the tr	ansitio	on may	be gra	dual.
WL			.5 ft WS OR WD	BORING STARTED 07/24/92		STS OFFIC			thbroo			
WL		₿	CR ACR	BORING COMPLETED 07/24/92		ENTERED E	3Y	SHE	ET NO.	1 OF	1	
WL				RIG/FOREMAN		APP'D BY		STS	S JOB N		•	

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CLIENT LOG OF BORING NUMBER B-114 POWER/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett HOK STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.: Chicago, Illinois Mdd PHOTO-IONIZATION DETECTOR READING (F LIQUID PLASTIC WATER SAMPLE TYPE SAMPLE DISTANCE RECOVERY LIMIT X LIMIT X CONTENT X ELEVATION DESCRIPTION OF MATERIAL - -.∆ DEPTH (FT) ջ STANDARD PENETRATION BLOWS/FT. 20 30 40 50 SURFACE ELEVATION Asphalt - gravel subbase Fill: Cinders, bricks, wood, sand and gravel - brown, black and gray - medium dense - moist (Rubble fill) 0.0 ⊗. 55 1 ₹21 SS 2 0.0 5.0 Ø. 0.0 55 3 Fine sand, little cinders, trace silt, gravel and bricks - brown and dark gray - medium dense - moist (Fill - SM) ⊗⁵ 0.0 SS 10.0 PΑ Fine to coarse sand, trace silt and gravel - brownish gray - medium dense to dense - moist to saturated (Fill - SP) ⊗." 0.0 SS SS Note: Thin gravel lenses. 0.0 Fine to coarse sand, trace silt and gravel - gray - dense - saturated (SM - SP) 6A SS 0.1 15.0 0.0 SS PA 0.0 8 SS 20.0 End of Boring Borehole grouted upon completion. The stratification lines represent the approximate boundary lines between soil types:in-situ, the transition may be gradual. BORING STARTED 07/27/92 STS OFFICE WĻ 12.5 ft WS Northbrook-01 BORING COMPLETED 07/27/92 SHEET NO. BCR WL ENTERED BY STS JOB NO. 27313-XH RIG/FOREMAN APP'D BY WL DR-9/Deon/Dumas DLG

	CLIENT POWER/CRSS					LOG OF B	ORING N	UMBER	B-1:	15		
	`\			PROJECT NAME		ARCHITEC	T-ENGIN	FFR				\dashv
STS Consu	alta.	.+c	1 + 11	Nonthwestern No.	morial Hospital		e Becke					- 1
SITE 10							\neg		CONFINED C	OMPRESS	IVE STRE	NGTH
Grand/	Co.	lum	bus	/Illinois/McClurg	Ct.; Chicago, Illinois		-	1 10	NS/FT. ² 2	3	4 5	,
DEPTH (FT) ELEVATION (FT)	9	SAMPLE TYPE	UISTANCE	DI	ESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPM)	PLASTI LIMIT X	X CONT	TER ENT % - •	LIQU: LIH:	11 x Δ
	٣	삙	ڲٚٳڿ				6 5		STANDAR	3D		
M	SAMPLE	N S	S L	SURFACE ELEVATION			王 문 동 문	8	PENETRA	ATION E	BLOWS/FT	
	-	Ā		Asphalt - grav	el subbase						Ī Ī	=
1	- 19	s	П	Fill: Cinders,	bricks, sand and gravel		0.0			⊗32	ļĺ	1
5		ss	נן	- brown, black dense - moist	: and gray - very loose t (Rubble fill)	o medium	0.0	⊗				
5.0	. !	SS	Π				0.0	⊗				
	- F	Α		Fine to medium	n sand, trace silt and gr	ravel		 	-	1	 	
10.0	\perp	SS	4	- brown and gr	ay - medium dense to der grated (Fill - SM)		30.4	⊗5				
5		SS PA		Note: Strong of Sample Stesting.	odor between 7.5 and 9 ft 6-4 and S-5 retained for	chemical	20.9		⊗,			
6	, !	ss	\prod				20.9			29		
15.0 7	-	SS S	\mathbf{H}	4			30.2		85			;
		Α	+						``			,
20.0	1	ss	ф	-			8.0			⊗35		ı L
				End of Boring	ed upon completion.	· -						
				Burenote grout	ted upon completion.					1		
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		The	str	atification lines repre	sent the approximate boundary]	ines between soi	1 types: 1	n-situ, t	he transit	on may	be grad	ua).
WL			13	ft WS OR WD	BORING STARTED 07/27/92		STS OFFI		Northbro	ok-01		
WL					BORING COMPLETED 07/27/92		ENTERED MG		SHEET NO	1	1	
WL 15 f	ft .	ΔB			RIG/FOREMAN DR-9/Jack/Dur	nas	APP'D BY		STS JOB	NO. 27313	3-XH	

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B-116 CLIENT LOG OF BORING NUMBER POWER/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett HOK STS Consultants Ltd UNCONFINED COMPRESSIVE STRENGTH TONS/FT. 2 1 2 3 4 5 SITE LOCATION Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois (Mdd) PHOTO-IONIZATION DETECTOR READING LIQUID PLASTIC WATER ELEVATION (FT) DE SURFACE ELEVATION LIMIT X LIHIT X CONTENT % DESCRIPTION OF MATERIAL ×--DEPTH (FT) 10 20 30 SAMPLE SAMPLE STANDARD
PENETRATION BLOWS/FT.
30 40 50 **⊗** Asphalt, limestone - gravel subbase Ø²⁶ Fill: Bricks, cinders, wood, sand, gravel and miscellaneous debris - brown and dark gray - loose-to very dense - moist (Rubble fill) SS 0.0 0.0 SS 5.0 8 lo.o 3 SS ⊗24 0.6 SS 10.0 Fine to medium sand, trace silt and gravel 0.0 SS - brownish gray - very dense - moist to saturated (Fill - SM) PΑ 0.0 SS 6 15.0 la o SS **8**\$ 0.0 8 SS End of Boring Borehole grouted upon completion. The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual. BORING STARTED 07/27/92 WS OR WD STS OFFICE 12.5 ft Northbrook-01 BORING COMPLETED 07/27/92 BCR SHEET NO. WL ENTERED BY STS JOB NO. 27313-XH RIG/FOREMAN APP'D BY 12.5 ft AB DR-9/Deon/Dumas DLG

CLIENT POWER/CRSS				LOG OF B	ORING N	JMBER	8-1	17		
		PROJECT NAME		ARCHITEC	T-ENGIN	FFR				
STS Consul	- ltants Ltd.	Nonthunghon Ma	morial Hospital	II	e Becke					
SITE LO	CATION				F	-O- U	NCONFINED (COMPRESS	SIVE STA	RENGTH
Grand/0	Columbus	/Illinois/McClurg	Ct.; Chicago, Illinois		-]]	ONS/FT.2	3	4	5
DEPTH (FT) ELEVATION (FT) PI F NO.	SAMPLE TYPE SAMPLE DISTANCE BECOVERY	D SURFACE ELEVATION	ESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPM)	PLAST LIMIT X	X CON	RD .	40 5	MIT ¥
	SAM	SURFACE ELEVATION			王	8	PENETA 20		BLOWS/F 40 5	T.
	PA	Asphalt - lime	stone gravel subbase					+	- -	=
2	SS L	Fill: Cinders, - brown and da (Rubble fill)	bricks, sand, gravel and rk gray – medium dense –	d wood moist	0.0				⊗ 4.	
3	SS PA	•			0.0	3			.8€	
10.0	SS PA	Fine to medium	sand, trace silt and gr	avel	0.0	⊗ ⁸	,			
6	PA SS	- brownish gra and saturated Note: Sewer od		e - moist	0.0		******	81		
15.0 7	PA SS	-			0.0			\[\tag{ \tag} \tag{ \tag{ \tag{ \tag{ \tag{ \tag{ \tag{ \tag{ \tag{ \ta	·····	5 0
8	PA SS	1			0.0				₩ 5	
20.0		End of Boring							ļ	
		Borenole grout	ed upon completion.							
	<u> </u>	<u></u>							<u> </u>	
	The str	atification lines repre	sent the approximate boundary li	nes between so:	l types: in	-sıtu, t	he transit	ion may	be gra	dual.
ML		.5 ft WS	BORING STARTED 07/27/92		STS OFFIC	:E	Northbro			
WL		BCR ACR	BORING COMPLETED 07/27/92		ENTERED E		SHEET NO			
WL			RIG/FOREMAN DR-9/Deon/Duma		APP'O BY	•	STS JOB			

CLIENT POWER/CRSS				LOG OF BO	RING NU	MBER	B-1	18	_		
		PROJECT NAME		ARCHITECT	CNCINE	<u></u>					
	-	Northwestern Mei	morial Hospital		Becket						
STS Consult		100 CHAESCELLI MEL	att at hospital	Elleibe	Decker		ONFINED (ONDOCCE	TVE STO	CNGTU	
SITE LOCA Grand/Co		/Illinois/McClurg	Ct.: Chicago, Illinois		• • • • • • • • • • • • • • • • • • •	Tor	NS/FT.2		4 5		
DEPTH (FT) ELEVATION (FT) SAMPLE NO.	SAMPLE TYPE SAMPLE DISTANCE RECOVERY	DE	ESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPM)	10	\$0 	•		пт х Д	
	AMP AMP	SURFACE ELEVATION	-		윤 욻	⊗ 10	STANDA PENETR	ATION E	LOWS/FT	<u>. </u>	
	PA	Asphalt - grav	ol subbase		 	10	50		10 50	'	
1	ss		bricks, sand, gravel, wood	1 204	0.0		Ø ²²				
2	SS I	miscellaneous medium dense (debris - brown and dark gra	ay -	0.0		8				
3	SS	chemical	testing.		0.0		320				
10.0	SS LI				0.0	3	3				
5 5A	SS	Fine to seed to	cond topics salt and array	.1	10.0	18	<u>y</u>	·····	⊗**		
6	SS S	- brownish gra (Fill - SM)	sand, trace silt and grave y - dense to very dense - s	saturated	0.0			₩.	[:∞		
15.0 7	SS S				0.0						
	PA III									55	
20.0	SS				0.0				[]	- 85	
		End of Boring Borehole grout	ed upon completion.								
			<u> </u>					<u> </u>	<u> </u>		
	The stratification lines represent the approximate boundary lines between soil types in-situ, the transition may be gradual.										
WL		ft WS OR WD	BORING STARTED 07/27/92		STS OFFIC		Northbr				
WL	E	SCR ACR	BORING COMPLETED 07/27/92] *	ENTERED B	ΙΥ	SHEET N	D. 04 1	F 1		
WL			RIG/FOREMAN DR-9/Deon/Dumas		APP'D BY DLG		STS JOB	NO. 27313	3-XH		

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	7			CLIENT POWED (CDSS		LOG OF BO	ORING N	UMBER		B-11	9		
	5.	5		POWER/CRSS PROJECT NAME		ARCHITECT	T-FNGTN	FFP					
STS Con	SUZ	- ants	l ta	Nonthungton No	morial Hospital		e Becke		K				
SITE	LOC	ATIO	N					1-0-		INED CO	MPRESS:	IVE STA	ENGTH
Gran	d/C	1UM	DUS	/1111nois/McClurg	Ct.; Chicago, Illinois		\ \$		I UNS/F	2 3	3	4 !	5
DEPTH (FT) ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	1	ESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPM)	PLAS LIMI >	T X <	20 3	O 4		Δ X
	AMP.	AMPL	₹ S	SURFACE ELEVATION				(9 1	TANDARC PENETRAT	TION B		
	Š	PA	S IE	Asphalt - lime			 	1	0 2	20 30 T	0 4	0 5	0
	1	SS	Π	Fill: Cinders,	brick, sand, gravel, wor	od and	0.0	╁┈┈┤		.85			
		PΑ	1	very loose - n	and dark gray — medium d noist (Rubble fill) ared concrete at 2.75 ft.			24					
5.0	2	SS	7	boring 3	1.5 ft. South and 1.0 ft.	East.	0.8	86	<u> </u>				
	2A	PA	4	Clayey, silty	sand, trace gravel - black (Fill)		/	 ⊗ .]		 			
	3	SS	中	Note: Sl.ghtly	organic odor. bricks, sand, gravel, w		5.0		⊗15	.			
10.0	4	PA SS	ф	stone - brown moist (Rubble	and dark gray - medium difill)	ense -	0.0				Ø ³²		
		PA	╫	- light brown	n sand, trace silt and grand gray - medium dense	avei to dense -				1	: 0		
	5	SS PA	Щ	moist and satu	rated (Fill - SM)		0.0			9	۶.]
15.0	6	SS	\dagger	1							χ.	39	
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20.0	7	SS	T	1						8₹			
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<u></u>		rhe	5tr		sent the approximate boundary li				the tr	ransitio	on may	be gra	oual.
WL			13	tt WS	BORING STARTED 07/27/92	. '	STS OFFI	CE	Nort	thbroo	k-01		
WL			E	CR ACR	BORING COMPLETED 07/27/92		ENTERED MG	BY	SHE	EET NO.	1 OF	1	
WL					RIG/FOREMAN DR-9/Jack/Mike		APP'D BY		STS	S JOB N			

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	77		CLIENT POWER/CRSS		LOG OF B	BORING NU	MBER		3-12	0		
	15		PROJECT NAME		ARCHITEC	T-ENGTH	:50					
STE Onno	<u>♣</u> .		Nonthungton Mor	morial Hospital		be Becke		к				
STS Consu						DC DCCKC			INED CO	MPRESS1	VE STRE	ENGTH
Grand/	Colu	mbus	/Illinois/McClurg	Ct.; Chicago, Illinois		'		TONS/F	1.5	3 4	VE STRE	
<u> </u>		П	-			- €		<u> </u>				
						PHOTO-IONIZATION DETECTOR READING (PPM)	PLAS	TIC	WAT	FR	LIQU	ar l
DEPTH (FT) ELEVATION (FT)		SAMPLE DISTANCE				E	LIMI	T X	CONTE		LIM	IT x
E S	. w	ZI	DE	SCRIPTION OF MATERIAL		75.75	×	< ·		•		Δ
DEPTH (FT) ELEVATION	SAMPLE NU.					후원	10	0 a	0 3	0 4	0 50	
	# #	릴빛							TANDARI	3		
	NA S	N C	SURFACE ELEVATION			¥ <u>=</u>	10	9 F	ENETRA	TION B	LOWS/FT	
	PA		Asphalt - lime	stone gravel subbase			i	· · · ·				
1	SS	$\Pi\Pi$	Fill: Cinders,	bricks, sand, gravel and o	decayed	0.0	i			.⊗35		
	 	HH	wood - brown, I	bricks, sand, gravel and o black and gray - medium der bble fill)	nse to	1						
2	SS	Ш	Very 1005e (nu	oble (111)		0.0	Ø		1			ĺ
5.0	PA	꾸끈	╡				ا ــــــــــــــــــــــــــــــــــــ				. 1	ļ
\equiv 3	ss	Ш				0.0	ゑ゚ ゚゚゚゚゚゚		1			
		Ш	Ⅎ .			İ	``.		ł			
	PA	$\dagger \dagger \dagger$	1					9			, 1	
□	SS	††††	Fine sand, lit	tle silt, trace gravel - b	rown and	3-8	 8	·				
10.0	PA	╁╬	gray - medium	dense - moist to saturated		1		٠.			<u> </u>	
5	SS		(F111 - SM)			0.5			⊗25		1	
	PA	144	<u> </u>				i			ĺ	il	
Б	SS	Ш				4.9] [23			
-		Ш	<u> </u>			1.5			83			
15.0	PA	†††	d						⊗26		, 1	
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	PA	╁╀										
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		- ST		sent the approximate boundary lines	o permeen 201			the C	11(21:0)	Uni May	ne Al.q	. 1001
WL		· <u>1</u> 3	WS OR WD	BORING STARTED 07/28/92		STS OFFI	CE	Nor	thbro	ok-01		
WL	WL BCR ACR BORING COMPLETED 07728/92					ENTERED MG	3Y	SH	EET NO	. OF	1	
WL 13 f	t AB			RIG/FOREMAN DR-9/Mike/Dumas		APP'D BY		ST	S JOB I	vo. 27313	 3-хн	

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Ca	CLIENT POWER/CRSS		LOG OF BO	ORING NU	IMBER	B-121		
	PROJECT NAME		ARCHITEC	T-ENGINE	ER			
STS Consultants Ltd.	Nonthuncton No	morial Hospital		e Becke				
SITE LOCATION					-O- UNO	CONFINED COM	PRESSIVE ST	RENGTH
Grand/Columbus	/Illinois/McClurg	Ct.: Chicago, Illinois		1	1	NS/FT. ² 2 3	4	5
ELEVATION (FT) SAMPLE NO. SAMPLE TYPE SAMPLE TYPE SAMPLE TYPE SAMPLE TYPE HECOVER	[ESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPH)	PLASTII LIMIT × -		IT X L3	OUID IMIT X - △
SAMPLE N				6일	Ω.	STANDARD		
N N N N N N N N N N N N N N N N N N N	SURFACE ELEVATION			품님	⊗ 10	PENETRATI 20 30	ION BLOWS/F 40	FT. 5 0
PA		stone gravel subbase			8 10			 -
1 SS	Fill: bricks, - brown and bl	wood, cinders, sand an ack - loose (Aubble fi	d gravel 11)	0.0				
5.0 PA	-			0.0	⊗ 3			
3 SS		•		0.0	⊗ 2/k•			
4 SS	Fine sand, tra - medium dense	ce silt and gravel - b - moist to saturated	rownish gray (Fill - SM)	0.0	⊗	⊗24		
10.0 PA				0.0		8		
6 55	=					12/5	•	
	Fine to medium	sand,trace silt and g	cavel	0.0		<u> </u>	9	-
5A SS 1	gray - mediu	m dense - saturated (S	M)	0.0		🛛		
7 SS				0.0			9	
B SS				0.0				
20.0	End of Boring							┿
		ed upon completion.						
	<u> </u>	and the annual burner		<u> </u>		1 1		<u> </u>
		sent the approximate boundary				e transition	n may be gra	agua] .
	ft WS OR WD	BORING STARTED 07/28/92		STS OFFICE		Northbrook		
	SCR ACR	BORING COMPLETED 07/28/92		ENTERED B	Υ	SHEET NO.		
WL		RIG/FOREMAN DR-9/Mike/Du	ımas	APP'D BY		STS JOB NO	27313-XH	

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	~				CLIENT		LOG OF BO	ORING NU	JMBER	B-	12	2		
					POWER/CRSS									
					PROJECT NAME	ARCHITECT-								
STS Con				d.	Northwestern Men	orial Hospital	Ellerb	e Becke	tt HOK					
SITE L	_0C.	AT I	ON nbi	IS/	/Illinois/McClura	Ct.; Chicago, Illinois) to	CONFINE NS/FI.2				- 1
- T						PHOTO-IONIZATION DETECTOR READING (PPM)	1		•	3 .	4	5		
=			l					8 9 8	PLASTI		WAT		LIQU	
DEPTH (FT) ELEVATION (FT)			Ş		•	CORPORATION OF MATERIAL		F B	LIMIT	* C	ONTE	NT X	LIN	띳ᆥᅵ
DEPTH (FT) ELEVATION		17E	STA		DE	SCRIPTION OF MATERIAL		ZŽ W	^			•		4
E X	S.	SAMPLE TY	SAMPLE DISTANCE	¥					10	50	3	0 4	0 5	0
8 3	SAMPLE			Š	SURFACE ELEVATION					STAR	NDAR	D		_
\bowtie	SAF			æ				王띰	⊗ 10	PENE			LOWS/F	0
		FA	$\overline{\Gamma}$	-		stone gravel subbase				Ø₹0				
	1	SS	П	Ш	Fill: Cinders,	bricks, wood, sand, gra	vel and	0.0		, \$ \$7				
			╫	П	stone fragment: (Rubble fill)	s – brown and gray – med	ium dense	0.0	8	•				
	2	SS	П	Н	(100016 1111)			10.0	^	۷., ا				1
5.0	_	PA	#											
	3	ss	$\ $					50.9		(24 9			
	_	PA	Щ	Ė							<u>`.</u>			
			T	T	Fine sand, tra	ce silt and gravel - gra moist to saturated (Fil	y - 1 - SM1	80.2			ć	30		1
	4	SS		۲										
10.0		PA	ļ.	Ļ	Note: Strong p	etroleum odor between 7.º	5 and 13 ft.		[ŀ				l i
	5	SS	П					130.4			85			1 1
		PA	щ	Щ						1	•			
	6	SS	П	П				20.2	1 1	1		⊗33		1
	0		Ш	Ц				-0.2	}			اب		
15.0		PA	$\overline{1}$	\mathbf{T}	Fine sand tra	ce silt and gravel - bro	unich annu			-				
	7	SS	П	Ш		to dense - saturated (S		2.0		-				R
		PA	╨	┢					1					:
		\vdash	╁	h				1.2						83
20.0	8	SS	11	Щ				11.2						&
20.0			╫	H	End of Boring				 				-	
				1	Borehole grout	ed upon completion.		1					1	
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	<u> </u>	Th	e s	tra	tification lines repre	sent the approximate boundary li	nes between sof	l types: 11	n-situ. ti	ne tran	siti	on may	be ora	dual.
WL			=		WS OR WD	BORING STARTED		STS OFFI						
					.5 ft WS	07/28/92				North				
WL				В	CR ACR	BORING COMPLETED 07/28/92		ENTERED I	3Y	SHEET		1	11	
WL	WL RIG/FOREMAN DR-9/Mike/Dumas					APP'D BY STS JOB NO. 27313-XH								

63		CLIENT POWER/CRSS		LOG OF BORING NUMBER			B-123			
		PROJECT NAME		ARCHITEC	T_ENGINE	ED				
070 022		Northwestern Mer	morial Hospital		e Becke					
STS Consult		1					ONFINED COMPE	RESSIVE ST	RENGTH	
Grand/C	clumbus	/Illinois/McClurg	Ct.; Chicago, Illinois				S/FT. ² 2 3	4	5	
OEPTH (FT) ELEVATION (FT) SAMPLE NO.	SAMPLE TYPE SAMPLE DISTANCE RECOVERY		SCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPN)	PLASTIC WATER LIMIT * CONTENT *			LIQUID LIMIT * \(\text{\Delta} \)	
	SAMPLE T				――[호흡]	8	STANDARD PENETRATIO	IN BLOWS/	FT.	
XI 5	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				0.0	10	50 30	40	50	
	PA		stone gravel subbase		/				16	
2	SS SS	bricks, sand,	weathered limestone fragm gravel and wood - brown, b dense to very dense (Rubb)	lack and	0.0			∅		
5.0	SS	į			1.8	X Q				
	SS PA	Fine sand, lit brownish gray saturated (Fil	tle silt, trace gravel - g - medium dense to dense - l - SM)	ray to moist to	1.8		⊗3⁴			
5	SS				0.4		83			
6 15.0	ss				0.1			⊗37		
7	SS]				0.0			⊗*	5	
8 20.0	SS L				0.0		8€.			
			ed upon completion.							
	The str	atification lines repre	sent the approximate boundary line	s between soi	l types: in	-situ, the	transition	may be gr	adual.	
WL	12	ws or wo ft WS	BORING STARTED 07/28/92		STS OFFIC		orthbrook	-01		
WL.	В	CR ACR	BORING COMPLETED 07/28/92		ENTERED B	Y	SHEET NO.	OF 1		
ML			RIG/FOREMAN		APP'D BY	•	STS JOB NO.	7242-40		

63	CLIENT POWER/CRSS		LOG OF E	ORING NUMBER	B-124	
	PROJECT NAME	· · · · · · · · · · · · · · · · · · ·	ARCHITEC	T-ENGINEER		
STS Consultants Ltd.	Nonth weekens No	morial Hospital	1	be Beckett HOK		
SITE LOCATION			<u> </u>	O u	NCONFINED COMPR	ESSIVE STRENGTH
Grand/Columbus	/Illinois/McClurg	Ct.; Chicago, Illinois			ONS/FT.2 2 3	4 5
DEPTH (FT) ELEVATION (FT) SAMPLE NO. SAMPLE TYPE SAMPLE DISTANCE	DE SURFACE ELEVATION	ESCRIPTION OF MATERIAL		10	20 30	x LIOUID x LIMIT x △ 40 50
	SURFACE ELEVATION				PENETRATION	N BLOWS/FT. 40 50
	Asphalt - lime	stone gravel subbase				
1 SS L PA 2 SS L 5.0 PA 3 SS L P	gravel and woo very dense (Au	bricks, stone fragments, d – brown and gray – dens bble fill)	sand, e to		8	7.V8
4 SS J	Ц				1 !	8
5 SS	Fine and mediu - brownish gra (Fill - SM)	m sand, trace silt and gr y - medium dense - moist	avel		.88	
6 55	Fine sand - hr	own - dense - saturated (SM)		8	
15.0 RB	- The Salia - Di	own - delise - sacdiaced (,JM)		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
7 SS L						Ø
RB	-					
	À					38
8 SS	4					9 1
	End of Boring					
	Borehole backf	illed upon completion				
	·			1 1 1	1	
					1 1	
	1					
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	,					
==						
The str	atification lines repre	sent the approximate boundary lin	es between so:	il types: in-situ,	the transition	may be gradual.
WL	WS OR ND	BORING STARTED 08/06/92		STS OFFICE	Northbrook-	
WL 13 ft	BCR ACR	BORING COMPLETED 08/06/92		ENTERED BY	SHEET NO.	OF 1
WL		RIG/FOREMAN DR-2/Dumas/Phi	1	APP'D BY DLG	STS JOB NO.	313-XH

CLIENT LOG OF BORING NUMBER B-125 POWER/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett HOK STS Consultants Ltd. UNCONFINED COMPRESSIVE STRENGTH TONS/FT.2 1 2 3 4 5 SITE LOCATION
Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois **PLASTIC** WATER LIQUID LIMIT X LIMIT X CONTENT X × -ELEVATION - A DESCRIPTION OF MATERIAL DEPTH (FT) 욷 10 30 50 SURFACE ELEVATION SAMPLE STANDARD PENETRATION BLOWS/FT. 20 30 40 50 ⊗ 10 Asphalt - limestone gravel subbase ss Fill: cinders, bricks, sand, gravel and wood - brown, black and gray - loose to medium dense - moist (Aubble fill) 8 SS 12 PA 5.0 3 SS PΑ ⅆ. SS PΑ 10.0 Fine sand, trace silt and gravel - brownish gray - dense - moist (Fill - SM) 8 SS PA Ø 6 SS PΑ Fine to medium sand, trace silt and gravel - gray - medium dense to dense - saturated (SM) 8 SS PΔ ⊗59 lв SS RB SS 9 RB 88 10 SS RB Silty clay, trace gravel and sand - gray - medium - saturated (CL) 11 ST RB 12 ST RB 40.0 ... continued STS JOB NO.27313-XH SHEET NO. 1 . OF 2 The stratification lines represent the approximate boundary lines between soil types:in-situ, the transition may be gradual.

	7				CLIENT POWER/CRSS		LOG OF E	BORING N	JMBER	- 1	B-12	:5		
	5 , 1	5		ŀ	PROJECT NAME		ARCHITEC	T-ENGINE	EER					
STS Con	sult	- ants	Lt	- !	Northwestern Men	morial Hospital		be Becke						
SITE	OC.	ATIO)N		77774	0			₩	NCONF ONS/F	INED CO	MPRES:	SIVE ST	RENGTH
Gran	d/C	lur	nbu	3/	Illinois/McClurg	Ct.; Chicago, Illinois			i	UNS/F	5	3	4	5
DEPTH (FT) ELEVATION (FT)		ter	TANCE		DE SURFACE ELEVATION	ESCRIPTION OF MATERIAL			PLAST LIMIT		CONT	TER ENT X		UID MIT x
불팀	₽.	TYPI	ois	_					10		20 3	30	40	50
DEPTH (FT) ELEVATION	SAMPLE	Ä	삧	띩							STANDAR	n		•
M	SAM	SAMI	SAM	띭	SURFACE ELEVATION				8	, ,	PENETRA	TION	BLOWS/F	T. 50
			П											
					Continued from	previous page								
		}						- }	1 1		}	,	}	
40.0			-	\mathbf{H}	Silty clay to	ace gravel and sand - gra	-		 -			} -		
	13	ST		Щ	medium - satur	ated (CL)	у -						1	
		_	Н	H	•						ļ			
		RB										1	1	
45.0		 	-	H										
	14	ST		Щ										
		RB	╀	H							-			
	15	ST	T	Щ					•		1	1		
50.0	13	۲,	Ш	H	 							<u> </u>		<u></u>
					End of Boring	ed upon completion			1 1					
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		Th	e s	tra	tification lines repre	sent the approximate boundary lin	es between so	il types: i	n-situ.	the t	ransit:	on ma	y be gr	adua 1 .
WL			. 1	3	ft WS OR WD	BORING STARTED 08/06/92		STS OFFI	CE	Nor	thbro	ok -0	1	
WL		10		BO	CR ACR	BORING COMPLETED 08/06/92		ENTERED MG	BY	SH	EET NO	. 2)F 2	
WL						RIG/FOREMAN DR-2/Dumas/Phi	1	APP'D BY		ST	S JOB	NO.	3-XH	

	7		CLIENT POWER/CRSS		LOG OF E	BORING NL	MBER	B-	-126		
POWER/CRSS PROJECT NAME Northwestern					ARCHITE	CT-ENGINE	FR				
STS Consult	<u>L</u> tant∈	ht I	Nonthungton Ho	morial Hospital	l l	be Becke					
SITE LOC	ATIC)N							D COMPRE	SSIVE ST	RENGTH
Grand/C	olun	abus	/Illinois/McClurg	Ct.; Chicago, Illinois			, i'	ONS/FT.	3	4	5
DEPTH (FT) ELEVATION (FT) SAMPLE NO.	SAMPLE TYPE	E DISTANCE	DE SURFACE ELEVATION	ESCRIPTION OF MATERIAL			PLAST LIMIT ×	x 20	30	LI	UID MIT X - \(\triangle \)
	를	A P	CHOEACE ELEVATION				8	PEN	INDARD IETRATION	BLOWS/F	
	PΑ	SE		stone gravel subbase			10	20	30		50
1	SS	$\Pi\Pi$	Fill: cinders.	bricks, sand, gravel an	id stone		1	ł	⊗3.	3	i i
5	SS		fragments - br to dense - moi	own, black and gray ~ ve st (Aubble fill)	ry loose			₩	···· *		
5.0	PA	 	1				₫.		1		1 1
3	SS	Щ	1				∞			1	
	PA	 	Medium to coar	se sand, trace gravel -	brown -			- .	84 8	+-	+-1
4	SS	Ш	medium dense -	moist (Fill - SP)	•			[]	<u> ا</u>		
10.0	РА	Щ.							<u> </u>	. 20	
5	SS	\coprod]							⊗39	
	PA	H	Fine to medium	sand, trace silt and gr	avel					+;	+
6	SS	$\ \ \ $	- brown - medi	um dense to extremely de	ense -					1	\$ ⁵⁰
15.0	PA	П	saturated (SW)						}		
7	SS	Ш]						•		
	РА	\sqcap							1		1 4
	+	H_1	+						1	· ·	8
20.0 B	SS		4							l	
			End of Boring								
			Horehole backt	illed upon completion							1 1
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	<u>L</u> .	Ш									
	The	str		sent the approximate boundary]	ines between so	il types: in	-situ, t	he tran	isition ma	ay be gra	idua].
13 ft WS (BORING STARTED 08/06/92		STS OFFIC	E	North	broak-()1	
				BORING COMPLETED 08/06/92		ENTERED B	Y	SHEET	1	OF 1	
WL 17.5	ft /	AB_		RIG/FOREMAN DR-2/Dumas/Ph	11	APP'D BY DLG		STS .	JOB NO. 273	13-XH	

		CLIENT		LOG OF E	BORING NU	MBER	I	B-12	7		
		POWER/CRSS									
		PROJECT NAME	i-l Hospital	3	CT-ENGINE						- 1
STS Consultants		Northwestern Mer	morial Hospital	Eller	be Becke						
SITE LOCATION Grand/Colum	ON Bous,	/Illinois/McClurg	Ct.; Chicago, Illinois				UNCONF TONS/F	T. 2		IVE STA	
DEPTH (FT) ELEVATION (FT) PLE NO.	E DISTANCE ERY	DE SURFACE ELEVATION	SCRIPTION OF MATERIAL				ιτ χ Κ − − ·				т х
SAMPLE SAMPLE	ECOV ECOV	SUBFACE FLEVATION				9	اك		TION B	LOWS/F1	į.
S O	0, 4	Asphalt - lime	stone oravel					20 3	1		
1 55	III		fine sand, gravel, clay se - moist (Rubble fill)	y and bricks				١,	⊗31		1
2 SS	╫╬	- loose to den	se - moist (Aubble fill)					85			i
	-	•									į
3 SS						₫					
PA		Fine cond too	ce silt and gravel - bro	0.00 =			ļ			-	
4 SS			o dense - moist (Fill -				⊗4.	ļ			
10.0 PA									····	46 م	
5 SS	Щ						ł	ŀ		.⊗.	
6 SS	Ш	Fine to medium	sand, trace silt and g	ravel				 	3		
15.0 PA	╟╫	- brown - dens (SM-SW)	e to very dense – saturi	ated		1				[```.	
7 SS	\prod										⊗55
PA							İ	ļ			
B SS	Ш								3€.		
20.0	╙					L			<u> </u>	ļ	
		End of Boring Borehole backf	illed upon completion								
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The	e stra	atification lines repre	sent the approximate boundary 1	lines between so	il types: ir	n-situ,	the t	ransiti	on may	be gra	dual.
WL	12	ws or wD ft WD	BORING STARTED 08/06/92		STS OFFI	CE	Non	thbro	nk -04		
WL		ft WD CR ACR	BORING COMPLETED 08/06/92		ENTERED I			EET NO	. 01		
WL			08706/92 RIG/FOREMAN		ENTERED I	-		S JOB	1	1	
14 ++ 10			DD=2/Dumae/Di	m 4 3	l in its		1 -		2724	3_ VLI	

CLIENT LOG OF BORING NUMBER B-128 Power/CRSS PROJECT NAME ARCHITECT-ENGINEER Northwestern Memorial Hospital Ellerbe Beckett/HOK STS Consultants Ltd. -O- UNCONFINED COMPRESSIVE STRENGTH SITE LOCATION TONS/FT.2 Grand/Columbus/Illinois/McClurg Ct.; Chicago, Illinois PHOTO-IONIZATION DETECTOR READING (P LIQUID SURFACE ELEVATION LIMIT X CONTENT % LIMIT X ELEVATION - **-** Δ DESCRIPTION OF MATERIAL ×--DEPTH (FT) 50 욷 10 30 SAMPLE STANDARD PENETRATION BLOWS/FT. 20 30 40 50 ⊗ 10 Asphalt – limestone gravel subbase PΑ \⊗₁₅ Rubble fill: Bricks, wood, sand, gravel, cinders, stone fragments - brown and gray - loose to SS <1 medium dense - moist <1 SS 5.0 ₫ <1 3 SS 6/6 <1 Ø SS Ø. Fill: Fine sand, trace silt and gravel - brown - loose - moist to wet (SM) ₹<u>1</u> 44 SS 30 5 SS <1 Fine sand, trace silt and gravel - brown - dense - saturated (SM-SW) ⊗33 <1 SS 6 14.5 End of Boring Monitoring well installed per enclosed well installation diagram. $\label{eq:constraint} % \begin{array}{ll} \text{Monitoring well installed} & \text{Supplementation} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Monitoring well installed} \\ \text{Monitoring well installed} & \text{Monitoring well installed} \\ \text{Mo$ The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual. WL WS OR WD BORING STARTED STS OFFICE 12 ft WS 09/05/92 Northbrook-01 BORING COMPLETED 09/05/92 ENTERED BY WL BCR SHEET NO. APP'D BY DLG RIG/FOREMAN STS JOB NO. DR-9/Dumas 27313-XH

					CLIENT POWER/CRSS			LOG OF BO	ORING N	JMBER		B-1	29		
				ŀ	PROJECT NAME			ARCHITEC	T-ENGIN	ER					-
STS Cor				1.	Northwestern Men	morial Hospital		Ellerb	e Becke						
SITE Gran	d/C	ATIC Olum)N I bu	s/	Illinois/McClurg	Ct.; Chicago, Illinois	5		Î	0	UNC: TON:	DNFINED (S/FT. ² 2	3		SENGTH
DEPTH (FT) ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	PLE DISTANCE	DVERY	DE	SCRIPTION OF MATERIAL			PHOTO-IONIZATION DETECTOR READING (PPM)		IT % × -		30		HIT %
X	SAM	SAM	SAH		SURFACE ELEVATION				₹ <u>P</u>		8 10	PENETR 20	ATION 30		T. 50
		PA				stone gravel subbase					8,1				
	1	SS SS PA		4	Rubble fill: B gravel, wood a loose - moist	ricks, stone fragments nd cinders - brown and	s, sand J gray	<u>.</u>	<1		8				
5.0	2	SS			Note: Concrete	obstruction at 3.0 ft	.		<1	8					
	3	SS		I	Fill: Fine to - gray - very	medium sand, trace sil loose to loose – moist	lt and to w	gravel et (SM)	<1	⊗.€					
10.0	4	SS		\prod					<1		\ <u>\</u>	`⊗''			
14.5	5	SS			Fine sand, tra to medium dens	ce silt and gravel - t e - saturated (SW-SM)	orown ·	- loose	'						
14.14			H		End of Boring			<u> </u>						<u> </u>	
					Monitoring wel well installat	l installed per enclos ion diagram.	sed mo	nitoring							
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	1	The	<u>L</u>	L.	tification lines repre	sent the approximate boundary	y lines	between soi	l types: 11	n-situ,	the	transii	ion ma	y be gra	Wal.
WL			1	2	WS OR WD	BORING STARTED 09/05/92			STS OFFI	CE	N	orthbr	ook-0	1	
WL				ВС		BORING COMPLETED 09/05/92			ENTERED KKB			SHEET N	_1	OF 1	
WL						RIG/FOREMAN DR-9/Dumas			APP'D BY			STS JOB	NO. 273	13-XH	- [

	7			CLIENT		LOG OF I	BORING N	UMBER	B-13	30		
	7	4		POWER/CRSS		APPHITE	CT-ENGIN	CEO				
STS Cor	neu I t	<u>.</u> ants	l †d	Nonthusetess No	morial Hospital	l l	be Beck					
SITE	LOC	ATIO	N				<u> </u>	I-O- UN	CONFINED C	OMPRESS:	IVE STR	ENGTH
Gran	d/C	olum	bus.	/Illinois/McClurg	Ct.; Chicago, Illinois		(Mdd)	10	ONS/FT. ²	3	4 5	i
DEPTH (FT) ELEVATION (FT)	E NO.	E TYPE	LE DISTANCE	DI SURFACE ELEVATION	ESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PP	PLASTI LIMIT X	x CONT	 -	LIGU LIM O 50	11 x Δ
₩	SAMPLE	AF		SUBFACE ELEVATION			₩	&	STANDAR PENETRA	TION B	LOWS/FT	
	S	PA	SE	Asphalt - crus	hed limestone gravel sub	base		10		30 4	0 50	
5.0	1 2 2A 3	SS SS SS PA SS		Rubble fill: b	ricks, cinders, sand, gr s, wood and coal - brown o medium dense - moist	avel.	<1 <1 <1 <1	⊗ 3 8 ⊗ ⊗ 3 6 ⊗ .				
		SS	Ш	Fill: Fine san	d, trace silt and gravel	- brown -	<1	1 1	22 -	\vdash		
10.0	4	SS PA		medium dense -	moist to wet (SM)		<1		⊗ 22			
10.0	5	SS PA	\prod				<1		⊗ 8			
15.0	6	SS	Щ	gray - medium	ce silt and gravel - bla dense - saturated (SM)		190		8			
17.0	7	SS	P		etroleum product odor an	o staining.	25				··⊗ ¹⁵	
				End of Boring								
				Monitoring wel	l installed per enclosed liagram.	well						
											·	
											:	
	1											
	1											
	1				•							
	1	The	Str	atification lines proces	sent the approximate boundary li	nec hetueen co	i) types: 1	0-511:: 41	he terreit	00.53"	he cost	tua?
1	_	1116	3(11	WS OR WD		iida udtween SO			ne transiti	.UII #89	ue yrac	.ng1.
WL WL				ft WS CR ACR	BORING STARTED 09/05/92		STS OFFI		Northbro			
				OR ACH	BORING COMPLETED 09/05/92		ENTERED KKB		SHEET NO	1	1	
WL	RIG/FOREMAN APP*D BY STS.JOB NO. DR-9/Dumas DLG 27313-XH											

C 3	CLIENT POWER/CRSS		LOG OF BOF	RING NU	JMBER	Е	3-13:	1	
PROJECT NAME ARCHITECT-ENGINE									
STS Consultants Ltd.	Northwestern Mei	morial Hospital	Ellerbe	Becke					
SITE LOCATION Grand/Columbus	/Illinois/McClurg	Ct.: Chicago, Illinois			φ.	ONS/FT	`.Z		STRENGTH 5
SAMPLE DISTANCE SAMPLE DISTANCE SAMPLE DISTANCE SAMPLE TYPE SAMPLE DISTANCE RECOVERY	DE	ESCRIPTION OF MATERIAL		PHOTO-IONIZATION DETECTOR READING (PPM)	PLAST LIMIT X	TIC (WATE CONTEN	ER NT %	LIQUID LIMIT * \(\text{\Delta}
SA SA SA SA SA SA SA SA SA SA SA SA SA S	SURFACE ELEVATION			王동	8) PI	ENETRAT	ION BLOW	/S/FT. 50
1 SS	Asphalt - lime	stone gravel subbase		<1			CKC	15/6	
1A SS 1	∃ sand.oravela	ricks, cinders, stone fra nd wood – brown, black ar o dense – moist	ngments, nd gray -	<1		8		***************************************	
3 SS 3 3A SS	Note: Sand len	ses at 5.0 ft.		<1 <1	3 /.6 ⊗ ⊗.				
4 SS	Fill: Fire san moist to wet (d - brown and gray - med: SM)	ium dense -	<1		Ø.4			
5 SS PA				<1			⊗ ²²		
6 SS 1	rine sand, tra medium dense -	ce silt and gravel - brow saturated (SM-SW)	√n −	<1					
7 SS	End of Boring			<1			Į.	⊗32	
	Monitoring wel	l installed per enclosed	well			•			
		sent the approximate boundary li				the tr	ansitio	n may be	gradual.
WL 12	.5 ft WS	BORING STARTED 09/05/92	s	TS OFFI	CE	Nort	hbroo	k-01	
	BCR ACR	BORING COMPLETED 09/05/92	E	NTERED &	BY		ET NO.	1 OF 1	
WL		RIG/FOREMAN DR-9/Dumas		PP'D BY		STS	JOB N		

Sept. Sept.



1	Project	CRSS	/NWMH	Site Asso	ssneut		STS Proje	ect No. <u>27</u>	3/3-XH			
•	Location _	TP	-1 (South C	Central Ar	cad Supe	r (64)		Date _ 7 /	20/92			
	Time St		y Sunny 8:10 1 8:25		actor Linda		make model					
	Ground	Ground Elevation capacity c.y. react										
	DEPTH	QР	Soil	Descripti	on	water cont.	excav. effort	boulder count Qty. Cl.	remark no.			
	0—		Asphalt-li	mestane gravel	subbase	D	M-E		_			
	1′—					_	-		Ø			
	2′—		bricks,	Fill - Sa Skel debris,	Pottery	\mathcal{D}	E	:				
	3′— 4′—		Rubble-C	inder-fill	- bricks							
	5′		Cinders	, Sand, gra	vel, charred	D	E					
	6'—		Large St	, Sand, gra coal cel Sheet pike	wallat 3,5'				Œ			
	7′			nd fill to		M	Ē		Ø			
	8'—				<i>U</i>							
	9′—		End of	1 Test P	it	!			!			
	10′—											
	11′—	-										
	12′—	-										
	13′—	-										
	14′—											
į		<u> </u>	<u> </u>				Ĺ <u></u>					
	REMA	ARKS:			PROPORT		ABBREV.	EXCAV				
	QP = (Calibrate	ed Penetronomete	er (tons/ft ²)	trace(tr.) little(lt.) some(so.) and	0-10% 10-20% 20-35% 35-50%	F—Fine M—Medium C—Course V—Very Gr.—Gray Bn.—Brown Yel.—Yellow	E—Basy M—Mode D—Diffice GROUND Elapsed time to reading	orate ult WATER (hrs.)			



Project	1355	/NWMH Site Assessment		STS Proje	ect No. $\frac{Z}{Z}$	7313-XH
Location _	TP:	-2 (NE-Central area of we	st 5up	perlot)	Date	120/92
Time St	arted	8:50 contractor Linda		EQUIPME make	ENT	
Time Co	mpletec	operator		model		
Ground	l Elevati	on capacity	(.У. reach		ft.
DEPTH	QP	Soil Description	water cont.	excav. effort	boulder count Qty. Cl.	remark no.
0-		Asphalt - Linestone gravel subase	D	M-Æ		
2′		Rubble fill - Cinders, bricks,		E		Ø
3′— 4′—		Sand, gravel, misc refuse and debris, coal.				
5'— 6'—		Large Clump of Steel Scap Encountered in excavation	D	M-E		
7' 8' 9'			D	E		,
10'-		F-M Sand f:11, Tan-gray Evel of Test pit	М	E		Ø
11′—	}	Evel of Test Dit				
12'—						
13′—				1		
14′—						
REMA QP = 0		PROPORT USE: ed Penetronometer (tons/ft ²) trace(tr.) little(it.) some(so.) and		ABBREV. F—Fine M—Medium C—Course V—Very Gr.—Gray Bn.—Brown Yel.—Yellow	E-Fasy M-Mode D-Diffic GROUND	erate ult WATER (hrs.)



]	Project	CRSS,	NWMH Site Assessm	ent		STS Proje	ect No. <u>27</u>	1313-XH
]	Location _	TP	-3 (NEC of Sup	perlot)			Date	120/92
	Time St	arted _	9:38 am contra 9:50 am operation capacit	ctor <u>Lindah</u> or		make model		ft. remark no.
	2'— 3'— 4'— 5'— 6'— 7'— 8'— 10'— 11'—	NA	Asphelt - Ls gravel son Rubble fill Bricks, wood, sand Steel febris, Cin gravel Lense & fiscol limesto at 5ft. Numbrous objects (possible cost Pert Fine to medium San Tan-gray End of Test F	ders, limestar me gravel cylindrical rings) pat	Dry Moist moist	NE E E		#Nu Ø
	12'		ed Penetronometer (tons/ft*)	PROPORT USEI trace(tr.) little(lt.) some(so.) and	0-10% 10-20% 20-35% 38-50%	ABBREV. F-Fine M-Medium C-Course V-Very GrGray BnBrown YelYellow	EXCAV EFF E—Easy M—Mode D—Diffic GROUND Elapsed time to reading	orate sult WATER (hrs.)



Project_C	R55,	NWMH Site Assessment		STS Proje	ect No. <i>27</i>	3/3-XH
Location _	TP	-4 (Sux of Middle hot)		·	Date _Z	120/92
Time St	arted ompleted	dy humid, 70° EX 11:00 contractor Line 11:15 operator capacity		make		ft.
DEPTH	QP	Soil Description	water cont.	excav. effort	boulder count Qty. Cl.	remark no.
1'—		As phalt and livestone gravel subsections		W-E		Ø
2'—		Rubble - Cinder fill - Einders, Bricks, sand, grave	2 4			10
3'— 4'—		bottles wood rooting shingles and tar (odor), Alternating lay		E		, –
5'— 6'—		F-M Sand fill, gray	+m	F		
8'—		End of Test Pit				
9'—					i	
11'—						
12'—		Note: Difficult access to				
14'—		Note: Difficult access to pit location due to densely parked cars				
	ARKS:	PROP	ORTIONS USED 0-10% 10-20%	ABBREV. F—Fine M—Medium C—Course V—Very Gr.—Gray Bn.—Brown Yel.—Yellow	EFF E—Easy M—Mode D—Diffic GROUNI	WATER (hrs.)



Project	R55/	NWM	H Site A	Assessmen	<i>t</i>		STS Proje	ect No. 27	1313-XH
Location _	TP	- 5	(NNW q	Kref+ BL	(1/2)			Date	20/92
Weathe Time St	or <u>Clou</u>	dy ,h	umid 70°	contractor	, ,		EQUIPME make		
i		i		operator					
		on		capacity			<u>.У.</u> reach		ft.
DEPTH	QP		Soil Descr	ription		water cont.	excav. effort	boulder count Qty. Cl.	remark no.
o_		North			South		1.0		HNU
1'	NA	As phe lime	lt (3") an	d crushed base		Dry	Z E		9
2'— 3'—			Rubble fil			Dry-			
4' 5'		Concrete	peat, sa	inders, was end, grav	el,	MOIST			Ø
6'— 7'—		Strudue (Possite Sewer)							
8'—			F-M sa	nd F:11,	gray-	MOIST	D-E		8
9′—			140						
10'—	<u> </u> 		End g	TEST Pit	-				
11'									İ
12'	1						,		:
13′	-					1			
14'—									
REMA		ed Penetro	onometer (tons/ft	*)	PROPORTUSE:		ABBREV. F.—Fine M.—Medium	EXCAV EFF E—Easy M—Mode	ORT
					little(lt.) some(so.) and	10-20% 20-35% 38-60%	M—Medium C—Course V—Very Gr.—Gray Bn.—Brown Yel.—Yellow	D—Diffic GROUND Elapsed time to reading	water Water (hrs.)



Project_C	rss/,	, NWMH Site Ass	essment		STS Proje	ect No. <u>27</u>	
Location _	TP	>-6 (NWC	of East Lot)			Date	120/92
Time St	arted ompleted	12:35 d 12:55	contractor Linda		make		ft.
DEPTH	QР	Soil Descr		water cont.	excav. effort	boulder count Qty. Cl.	remark no.
0-1'	NA	Asphalt - Limestone s Black Tubble +:		D	ME		Ø
2'— 3'—		Silty-Clay of gray, mothed tr sa, gr, shale	, slightly organic	D-M	E		Ø
5′—		Rubble fill - bricks, metall debris, charce	Wood, glass, ic scrap, burn ol, sand, gravel	D	E		Ø
8'— 9'—		F.M Sand fill,	0	м	E		8
10'		End of Te	or pit				
11'—							
13′—							
14'—	•						
REMA QP = 0		ed Penetronometer (tons/ft	PROPOR USB trace(tr.) little(lt.) some(so.) and		ABBREV. F—Fine M—Medium C—Course V—Very Gr.—Gray Bn.—Brown Yel.—Yellow	EFF E—Easy M—Mode D—Diffic GROUND Elapsed time to	erate cult OWATER 527(hrs.)



	Project	_RSS/	NWMH Site	Assessme	ut .		STS Proje	ect No. <u>27</u>	313-XH
	Location _	TP.	-7 (North 6	uteal area	of Supe	erlo4)		Date	20/92
	Time St Time Co	arted _	y Cloudy, 70° 1:45 1 2:10	_ contractor .	Lindah		EQUIPME make model reach		ft.
	DEPTH	QP	Soil Desc	ription		water cont.	excav. effort	boulder count Qty. Cl.	remark no.
	1'— 2'—	NA	Asphalt-Gravel Gravel Fill, DK	gray- brown		D	M-E	•	Ø
	3'— 4'—		Rubble fill - & Stone and come asphalt, same	ente block	,	D	M-E		Ø
	5'		Note: Batton	ebris		D wet	E		Ø
C	8'— 9'—		Seepage Concrete State End of te	b Chasemel st pit (i	nt Flor) (ctusal)		D		
	10' 11'		·						
	12'—								
	14'								
	REMA QP = 0		ed Penetronometer (tons/f	ît ^a)	PROPORT USEI trace(tr.) little(lt.) some(so.) and	0-10% 10-20% 20-35% 38-50%	ABBREV. F—Fine M—Medium C—Course V—Very Gr.—Gray Bn.—Brown Yell.—Yellow	EXCAV EFF E—Basy M—Mode D—Diffic GROUND Elapsed time to reading	ort erate sult OWATER (hrs.)

STS General Notes



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DRILLING & SAMPLING SYMBOLS:

88 : Split Spoon-1 3/8" I.D., 2" O.D.

Unless otherwise noted

Shelby Tube-2" O.D.,

Unless otherwise noted

PA : Power Auger

DB: Diamond Bit-NX, BX, AX

AS : Auger Sample

JS : Jar Sample

VS : Vane Shear

OS: Osterberg Sampler-3" Shelby Tube

HS: Hollow Stem Auger

WS: Wash Sample

FT: Fish Tail

RB: Rock Bit BS: Bulk Sample

PM: Pressuremeter Test, In-Situ

GS: Giddings Sampler

Standard "N" Penetration:

Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon

sampler, except where otherwise noted.

WATER LEVEL MEASUREMENT SYMBOLS:

WL: Water Level

WS: While Sampling

WD: While Drilling

AB : After Boring

WCI: Wet Cave In DCI : Dry Cave In

BCR: Before Casing Removal

ACR: After Casing Removal Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable groundwater levels. In impervious soils, the accurate determination of groundwater elevations

may not be possible, even after several days of observations; additional evidence of groundwater elevations must be sought.

GRADATION DESCRIPTION & TERMINOLOGY:

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

Major Component Of Sample	Size Range	Description Of Components Also Present in Sample	Percent Of Dry Weight
Boulders	Over 8 in. (200 mm)	Trace	1-9
Cobbles	8 inches to 3 inches (200 mm to 75 mm)	Little	10-19
Gravel	3 inches to #4 sieve (75 mm to 4.76 mm)	Some	20-34
Sand	#4 to #200 sieve (4.76 mm to 0.074 mm)	And	36-60
Silt	Passing #200 sieve (0.074 mm to 0.005 mm)		
Clay	Smaller than 0.005 mm		

CONSISTENCY OF COHESIVE SOILS:

RELATIVE DENSITY OF GRANULAR SOILS:

Unconfined Compressive			
Strength, Qu, tsf	Consistency	N-Blows per ft.	Relative Density
0.25	Very Soft	0-3	Very Loose
0.25-0.49	Soft-	4-9	Loose
0.50-0.99	Medium (Firm)	10-29	Medium Dense
1.00-1.99	Stiff	30-49	Dense
2.00-3.99	Very Stiff	50-80	Very Dense
4.00-8.00	Hard	>80	Extremely Dense
>8.00	Very Hard		

STS Soil Classification System



Maj	or Divisio	ons	Group symbols	Typical names		Laboratory classification	criteria			
	tion	avels o fines)		Well-grades gravels, gravel-sand mixtures, little or no fines	ained	$C_{u} = \frac{D_{us}}{D_{us}}$ greater than 6; C_{u}	$c = \frac{(D_{10})^i}{D_{10} \times D_{00}}$ between I and 3			
size)	tls coarse fract 4 sieve sizel	Clean gravels (Little of no fines)	GP	Poorly graded gravels, gravel- sand mixtures, little or no fines	e), coarse-gr	Not meeting all gradation rec	quirements for GW			
o. 200 sieve	Gravels (More than half of coarse fraction larger than No. 4 sieve size)	th fines amount es)	GM d	Silty gravels, gravel-sand-silt mixtures	1 5 5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I.			
Coarse-grained soils (More than No. 200 sieve size)	(More lang	Gravels with fines (Appreciable amount of fines)	GC	Clayey gravels, gravel-sand-clay mixtures	grain-size curve. ler ihan No. 200 GW, GF GM, GG GM, GC Sorderlii	Atterberg limits above "A" line with P.I. greater than 7				
Coarse-grained soils material is <i>larger</i> tha	tion zc)	sands no fines)	SW:	Well-graded sands, gravelly sands, little or no fines	gravel from fraction smal	$C_{\rm u} = \frac{D_{\rm to}}{D_{\rm in}}$ greater than 4; C	$c = \frac{(D_{10})^3}{D_{10} \times D_{00}} \text{ between 1 and 3}$			
than half of	Sands If of coarse fracin No. 4 sieve si	Sunds with fines Sunds with fines Sunds with fines Sunds with fines Appreciable amount Clan sands Clan sands Clan sands Clan sands Clan sands Clan sands Clan sands Clan sands Clan sands Clan sands Clan sands Sunds with fines Clan sands Clan sands Sunds sands Clan sands Cla		of sand and gree of fines (Not meeting all gradation i	requirements for SW				
(More	Sar e than half o maller than h	Sunds with fines (Appreciable amount of fines)	SM d	Silty sands, sand-silt mixtures	Determine percentages of san Depending on percentage of soils are classified as follows: Less than 5 per cent More than 12 per cent	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatcher zone with P.1. between and 7 are borderline case			
	(Mor s si	Sunds w (Appreciate	SC	Clayey sands, sand-clay mix- tures	Determine Depending soils are cl Less th More tl	Atterberg limits above "A" line with P.1. greater than 7	requiring use of dual symbols			
						ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity			assification of fine-grained —	
cve)	and clays	and clays	Silts and clays	an	CL	Inorganic clays of low to me- dium plasticity, gravelly clays, sandy clays, silty clays, lean clays	50 grained Atterb	soils. erg Limits plotting in — area are borderline class- is requiring use of dual —	СН	
Fine-grained soils material is <i>smaller</i> than No. 200 sieve)	Silks	(Liquid limit less th	OL	Organic silts and organic silty clays of low plasticity	Equation	n of A-line: ————————————————————————————————————				
Fine-grained soils naterial is <i>smaller</i> th	smaller that	(OS n		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	G. 20	CL , ,	OH and MH			
	Silts and clays	(Liquid limit greater than 50)	СН	Inorganic clays of high plas- ticity, fat clays	10 7 4 C1-MI	M1 and OL				
(More than half of	Silt	(Liquid lin	он	Organic clays of medium to high plasticity, organic silts	0 10	20 30 40 50 6	50 70 80 90			
(Mo	Highly organic soils		Pt	Peat and other highly organic soils		Liquid Lin Plasticity Ch	nit			

SUBSURFACE EXPLORATION PROCEDURES

Hand-Auger Drilling (HA)

In this procedure, a sampling device is driven into the soil by repeated blows of a sledge hammer. When the sampler is driven to the desired sample depth, the soil sample is retrieved. The hole is then advanced by manually turning the hand auger until the next sampling depth increment is reached. The hand auger drilling between sampling intervals also helps to clean and enlarge the bore hole in preparation for obtaining the next sample.

Power Auger Drilling (PA)

In this type of drilling procedure, continuous flight augers are used to advance the bore holes. They are turned and hydraulically advanced by a truck or track-mounted unit as site accessibility dictates. In auger drilling, casing and drilling mud are not required to maintain open bore holes.

Hollow Stem Auger Drilling (HS)

In this drilling procedure, continuous flight augers having open stems are used to advance the bore holes. The open stem allows the sampling tool to be used without removing the augers from the bore hole. Hollow stem augers thus provide support to the sides of the bore hole during the sampling operations.

Rotary Drilling (RB)

In employing rotary drilling methods, various cutting bits are used to advance the bore holes. In this process, surface casing and/or drilling fluids are used to maintain open bore holes.

Diamond Core Drilling (DB)

Diamond core drilling is used to sample cemented formations. In this procedure, a double tube (triple tube) core barrel with a diamond bit cuts an annular space around a cylindrical prism of the material sampled. The sample is retrieved by a catcher just above the bit. Samples recovered by this procedure are placed in sturdy containers in sequential order.



SAMPLING PROCEDURES

Auger Sampling (AS)

In this procedure, soil samples are collected from cuttings off of the auger flights as they are removed from the ground. Such samples provide a general indication of subsurface conditions; however, they do not provide undisturbed samples, nor do they provide samples from discrete depths.

Split-Barrel Sampling (SS) — (ASTM Standard D-1586-84)

In the split-barrel sampling procedure, a 2 inch 0.D., split barrel sampler is driven into the soil a distance of 18 inches by means of a 140 pound hammer falling 30 inches. The value of the Standard Penetration Resistance is obtained by counting the number of blows of the hammer over the final 12 inches of driving. This value provides a qualitative indication of the in-place relative density of cohesionless soils. The indication is qualitative only, however, since many factors can significantly affect the Standard Penetration Resistance Value, and direct correlation of results obtained by drill crews using different rigs, drilling procedures, and hammer-rod-spoon assemblies should not be made. A portion of the recovered sample is placed in a sample jar and returned to the laboratory for further analysis and testing.

Shelby Tube Sampling Procedure (ST) -- (ASTM Standard D-1587-83)

In the shelby tube sampling procedure, a thin-walled steel seamless tube with a sharp cutting edge is pushed hydraulically into the soil and a relatively undisturbed sample is obtained. This procedure is generally employed in cohesive soils. The tubes are carefully handled in the field to avoid excessive disturbance and are returned to the laboratory for extrusion and further analysis and testing.

Giddings Sampler (GS)

This type of sampling device consists of 5-ft. sections of thin-wall tubing which are capable of retrieving continuous columns of soil in 5-ft. maximum increments. Because of a continuous slot in the sampling tubes, the sampler allows field determination of stratification boundaries and containerization of soil samples from any sampling depth within the 5-ft. interval.



LABORATORY PROCEDURES

Water Content (Wc)

The water content of a soil is the ratio of the weight of water in a given soil mass to the weight of the dry soil. Water content is generally expressed as a percentage.

Hand Penetrometer (Qp)

In the hand penetrometer test, the unconfined compressive strength of a soil is determined, to a maximum value of 4.5 tons per square foot (tsf), by measuring the resistance of the soil sample to penetration by a small, spring-calibrated cylinder. The hand penetrometer test has been carefully correlated with unconfined compressive strength tests, and thereby provides a useful and a relatively simple testing procedure in which soil strength can be quickly and easily estimated.

Unconfined Compression Tests (Qu)

In the unconfined compression strength test, an undisturbed prism of soil is loaded axially until failure or until 20% strain has been reached, whichever occurs first.

Dry Density (8D)

The dry density is the quantity used as a measure of the amount of solids in a unit volume of soil aggregate. Use of this value is often made when measuring the degree of compaction of a soil.

Classification of Samples

In conjunction with the sample testing program, all soil samples are examined in our laboratory and classified on the basis of their texture and plasticity in accordance with United Soil Classification System (USCS). The soil descriptions on the boring logs are in conformance with this system and the estimated group symbols according to this system are included in parentheses following the soil descriptions on the boring logs. Included on a separate sheet entitled "General Notes" is a brief explanation of this system of soil classification.

STS Standard Boring Log Procedures



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In the process of obtaining and testing samples and preparing this report, standard procedures are followed regarding field logs, laboratory data sheets and samples.

Field logs are prepared during performance of the drilling and sampling operations and are intended to essentially portray field occurrences, sampling locations and procedures.

Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory by more experienced soil engineers, and differences between the field logs and the final logs may exist.

The engineer preparing the report reviews the field and laboratory logs, classifications and test data, and using judgment and experience in interpreting this data, may make further changes.

Samples taken in the field, some of which are later subjected to laboratory tests, are retained in our laboratory for sixty days and are then destroyed unless special disposition is requested by our client. Samples retained over a long period of time, even in sealed jars, are subject to moisture loss which changes the apparent strength of cohesive soil, generally increasing the strength from what was originally encountered in the field. Since they are then no longer representative of the moisture conditions initially encountered, observers of these samples should recognize this factor.

It is common practice in the geotechnical engineering profession that field logs and laboratory data sheets not included in engineering reports, because they do not represent the engineer's final opinions as to appropriate descriptions for conditions encountered in the exploration and testing work. On the other hand, we are aware that perhaps certain contractors and subcontractors submitting bids or proposals on work might have an interest in studying these documents before submitting a bid or proposal. For this reason, the field logs are retained in our office for review by all contractors submitting a bid or proposal. We would welcome the opportunity to explain any changes that have been and typically are made in the preparation of our final reports, to the contractor or subcontractors, before the firm submits its bid or proposal, and to describe how the information was obtained to the extent the contractor or subcontractor wishes. Results of laboratory tests are generally shown on the boring logs or are described in the text of the report, as appropriate.

The descriptive terms and symbols used on the logs are described on the attached sheet, entitled: "General Notes".

010RI10/89WP5K





AMERICAN SOCIETY FOR TESTING AND MATERIALS

Standard Method for PENETRATION TEST AND SPLIT-BARREL SAMPLING OF SOILS¹

This standard is issued under the fixed designation D 1588; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of the last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (€) indicates an editorial change since the last revision or reapproval.

This method has been approved for use by agencies of the Department of Defense and for listing in the DOD Index of Specifications and Standards.

1. Scope

- 1.1 This method describes the procedure, generally known as the Standard Penetration Test (SPT), for driving a split-barrel sampler to obtain a representative soil sample and a measure of the resistance of the soil to penetration of the sampler.
- 1.2 This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. For a specific precautionary statement, see 5.4.1
- 1.3 The values stated in inch-pound units are to be regarded as the standard.

2. Applicable Documents

2.1 ASTM Standards:

- D2487 Test Method for Classification of Soils for Engineering Purposes²
- D2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)²
- D4220 Practice for Preserving and Transporting Soil Samples²

3. Descriptions of Terms Specific to This Standard

3.1 anvil—that portion of the driveweight assembly which the hammer

- strikes and through which the hammer energy passes into the drill rods.
- 3.2 cathead—the rotating drum or windlass in the rope-cathead lift system around which the operator wraps a rope to lift and drop the hammer by successively tightening and loosening the rope turns around the drum.
- 3.3 drill rods—rods used to transmit downward force and torque to the drill bit while drilling a borehole.
- 3.4 drive-weight assembly—a device consisting of the hammer, hammer fall guide, the anvil, and any hammer drop system.
- 3.5 hammer—that portion of the drive-weight assembly consisting of the 140 ± 2 lb $(63.5 \pm 1$ kg) impact weight which is successively lifted and dropped to provide the energy that accomplishes the sampling and penetration.
- 3.6 hammer drop system—that portion of the drive-weight assembly by which the operator accomplishes the lifting and dropping of the hammer to produce the blow.
- 3.7 hammer fall guide—that part of the drive-weight assembly used to guide the fall of the hammer.
- 3.8 N-value—the blowcount representation of the penetration resistance of the soil. The N-value, reported in blows per foot, equals the sum of the number of blows required to drive the sampler over the depth interval of 6 to 18 in. (150 to 450 mm) (see 7.3).
- 3.9 AN—the number of blows obtained from each of the 6-in. (150-mm)

- intervals of sampler penetration (see 7.3).
- 3.10 number of rope turns—the total contact angle between the rope and the cathead at the beginning of the operator's rope slackening to drop the hammer, divided by 360° (see Fig. 1).
- 3.11 sampling rods—rods that connect the drive-weight assembly to the sampler. Drill rods are often used for this purpose.
- 3.12 SPT—abbreviation for Standard Penetration Test, a term by which engineers commonly refer to this method.

4. Significance and Use

- 4.1 This method provides a soi_nple for identification purposes and for
 laboratory tests appropriate for soil
 obtained from a sampler that may produce large shear strain disturbance in
 the sample.
- 4.2 This method is used extensively in a great variety of geotechnical exploration projects. Many local correlations and widely published correlations which relate SPT blowcount, or N-value, and the engineering behavior of earthworks and foundation are available.

¹This method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of subcommittee D18.02 on Sampling and Related Field Testing for Soil Investigations.

Current edition approved Sept. 11, 1984. Published November 1984. Originally published as D1586—58T. Last previous edition D1586—67 (1974).

²Annual Book of ASTM Standards, Vol 04.08.

5. Apparatus

- 5.1 Drilling Equipment—Any drilling equipment that provides at the time of sampling a suitably clean open hole before insertion of the sampler and ensures that the penetration test is performed on undisturbed soil shall be acceptable. The following pieces of equipment have proven to be suitable for advancing a borehole in some subsurface conditions.
- 5.1.1 Drag, Chopping, and Fishtail Bits, less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm) in diameter may be used in conjunction with open-hole rotary drilling or casing-advancement drilling methods. To avoid disturbance of the underlying soil, bottom discharge bits are not permitted; only side discharging bits are permitted.
- 5.1.2 Roller-Cone Bits, less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm) in diameter may be used in conjunction with open-hole rotary drilling or casing-advancement drilling methods if the drilling fluid discharge is deflected.
- 5.1.3 Hollow-Stem Continuous Flight Augers, with or without a center bit assembly, may be used to drill the boring. The inside diameter of the hollow-stem augers shall be less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm).
- 5.1.4 Solid, Continuous Flight, Bucket and Hand Augers, less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm) in diameter may be used if the soil on the side of the boring does not cave onto the sampler or sampling rods during sampling.
- 5.2 Sampling Rods—Flush-joint steel drill rods shall be used to connect the split-barrel sampler to the drive-weight assembly. The sampling rod shall have a stiffness (moment of inertia) equal to or greater than that of parallel wall "A" rod (a steel rod which has an outside diameter of 1% in. (41.2 mm) and an inside diameter of 1% in. (28.5 mm).
- NOTE 1—Recent research and comparative testing indicates the type rod used, with stiffness ranging from "A" size rod to "N" size rod, will usually have a negligible effect on the N-values to depths of at least 100 ft (30 m).
- 5.3 Split-Barrel Sampler—The sampler shall be constructed with the dimensions indicated in Fig. 2. The driving shoe shall be of hardened steel and shall be replaced or repaired when it

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becomes dented or distorted. The use of liners to produce a constant inside diameter of 1% in. (35 mm) is permitted, but shall be noted on the penetration record if used. The use of a sample retainer basket is permitted, and should also be noted on the penetration record if used.

NOTE 2—Both theory and available test data suggest that N-values may increase between 10 to 30% when liners are used.

5.4 Drive-Weight Assembly:

6.4.1 Hammer and Anvil—The hammer shall weigh 140 ± 2 lb (63.5 ± 1) kg) and shall be a solid rigid metallic mass. The hammer shall strike the anvil and make steel on steel contact when it is dropped. A hammer fall guide permitting a free fall shall be used. Hammers used with the cathead and rope method shall have an unimpeded overlift capacity of at least 4 in. (100 mm). For safety reasons, the use of a hammer assembly with an internal anvil is encouraged.

NOTE 3—It is suggested that the hammer fall guide be permanently marked to enable the operator or inspector to judge the hammer drop height.

- 5.4.2 Hammer Drop System—Ropecathead, trip, semi-automatic, or automatic hammer drop systems may be used, providing the lifting apparatus will not cause penetration of the sampler while re-engaging and lifting the hammer.
- 5.5 Accessory Equipment—Accessories such as labels, sample containers, data sheets, and groundwater level measuring devices shall be provided in accordance with the requirements of the project and other ASTM standards.

6. Drilling Procedure

- 6.1 The boring shall be advanced incrementally to permit intermittent or continuous sampling. Test intervals and locations are normally stipulated by the project engineer or geologist. Typically, the intervals selected are 5 ft (1.5 m) or less in homogeneous strata with test and sampling locations at every change of strata.
- 6.2 Any drilling procedure that provides a suitably clean and stable hole before insertion of the sampler and assures that the penetration test is performed on essentially undisturbed soil shall be acceptable. Each of the follow-

ing procedures have proven to be acceptable for some subsurface conditions. The subsurface conditions anticipated should be considered when selecting the drilling method to be used.

- 6.2.1 Open-hole rotary drilling method.
- 6.2.2 Continuous flight hollow-stem auger method.
 - 6.2.3 Wash boring method.
- 6.2.4 Continuous flight solid auger method.
- 6.3 Several drilling methods produce unacceptable borings. The process of jetting through an open tube sampler and then sampling when the desired depth is reached shall not be permitted. The continuous flight solid auger method shall not be used for advancing the boring below a water table or below the upper confining bed of a confined non-cohesive stratum that is under artesian pressure. Casing may not be advanced below the sampling elevation prior to sampling. Advancing a boring with bottom discharge bits is not permissible. It is not permissible to advance the boring for subsequent insertion of the sampler solely by means of previous sampling with the SPT sampler.
- 6.4 The drilling fluid level within the boring or hollow-stem augers shall be maintained at or above the in situ groundwater level at all times during drilling, removal of drill rods, and sampling.

7. Sampling and Testing Procedure

- 7.1 After the boring has been advanced to the desired sampling elevation and excessive cuttings have been removed, prepare for the test with the following sequence of operations.
- 7.1.1 Attach the split-barrel sampler to the sampling rods and lower into borehole. Do not allow the sampler to drop onto the soil to be sampled.
- 7.1.2 Position the hammer above and attach the anvil to the top of the sampling rods. This may be done before the sampling rods and sampler are lowered into the borehole.
- 7.1.3 Rest the dead weight of the sampler, rods, anvil, and drive weight on the bottom of the boring and apply a seating blow. If excessive cuttings are encountered at the bottom of the boring, remove the sampler and sampling rods from the boring and remove the cuttings.
- 7.1.4 Mark the drill rods in three successive 6-in. (0.15-m) increments

so that the advance of the sampler under the impact of the hammer can be easily observed for each 6-in. (0.15-m) increment.

7.2 Drive the sampler with blows from the 140-lb (63.5-kg) hammer and count the number of blows applied in each 6-in. (0.15-m) increment until one of the following occurs:

7.2.1 A total of 50 blows have been applied during any one of the three 6-in. (0.15-m) increments described in 7.1.4.

7.2.2 A total of 100 blows have been applied.

7.2.3 There is no observed advance of the sampler during the application of 10 successive blows of the hammer.

7.2.4 The sampler is advanced the complete 18 in. (0.45 m) without the limiting blow counts occurring as described in 7.2.1, 7.2.2, or 7.2.3.

7.3 Record the number of blows required to effect each 6 in. (0.15m) of penetration or fraction thereof. The first 6 in. is considered to be a seating drive. The sum of the number of blows required for the second and third 6 in. of penetration is termed the "standard penetration resistance", or the "N-value". If the sampler is driven less than 18 in. (0.45 m), as permitted in 7.2.1, 7.2.2, or 7.2.3, the number of blows per each complete 6-in. (0.15-m) increment and per each partial increment shall be recorded on the boring log. For partial increments, the depth of penetration shall be reported to the nearest 1 in. (25 mm), in addition to the number of blows. If the sampler advances below the bottom of the boring under the static weight of the drill rods or the weight of the drill rods plus the static weight of the hammer, this information should be noted on the boring log.

7.4 The raising and dropping of the 140-lb (63.5-kg) hammer shall be accomplished using either of the following two methods:

7.4.1 By using a trip, automatic, or semi-automatic hammer drop system which lifts the 140-lb (63.5-kg) hammer and allows it to drop 30 ± 1.0 in. (0.76 m ± 25 mm) unimpeded.

7.4.2 By using a cathead to pull a rope attached to the hammer. When the cathead and rope method is used the system and operation shall conform to the following:

7.4.2.1 The cathead shall be essentially free of rust, oil, or grease and have a diameter in the range of 6 to 10 in. (150 to 250 mm).

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7.4.2.2 The cathead should be operated at a minimum speed of rotation of 100 RPM, or the approximate speed of rotation shall be reported on the boring log.

7.4.2.3 No more than 2% rope turns on the cathead may be used during the performance of the penetration test, as shown in Fig. 1.

NOTE 4—The operator should generally use either 1% of 2% rope turns, depending upon whether or not the rope comes off the top (1% turns) or the bottom (2% turns) of the cathead. It is generally known and accepted that 2% or more rope turns considerably impedes the fall of the hammer and should not be used to perform the test. The cathead rope should be maintained in a relatively dry, clean, and unfrayed condition.

7.4.2.4 For each hammer blow, a 30-in. (0.76-m) lift and drop shall be employed by the operator. The operation of pulling and throwing the rope shall be performed rhythmically without holding the rope at the top of the stroke.

7.5 Bring the sampler to the surface and open. Record the percent recovery or length of sample recovered. Describe the soil samples recovered as to composition, color, stratification, and condition, then place one or more representative portions of the sample into sealable moisture-proof containers (jars) without ramming or distorting any apparent stratification. Seal each container to prevent evaporation of soil moisture. Affix labels to the containers bearing job designation, boring number, sample depth, and the blow count per 6-in. (0.15-m) increment. Protect the samples against extreme temperature changes. If there is a soil change within the sampler, make a jar for each stratum and note its location in the sampler barrel.

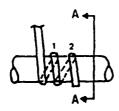
8. Report

- 8.1 Drilling information shall be recorded in the field and shall include the following:
 - 8.1.1 Name and location of job,
 - 8.1.2 Names of crew,
- 8.1.3 Type and make of drilling machine,
 - 8.1.4 Weather conditions,
- 8.1.5 Date and time of start and finish of boring,
- 8.1.6 Boring number and location (station and coordinates, if available and applicable),
 - 8.1.7 Surface elevation, if available,
- 8.1.8 Method of advancing and cleaning the boring,

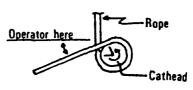
- 8.1.9 Method of keeping boring
- 8.1.10 Depth of water surface and drilling depth at the time of a noted loss of drilling fluid, and time and date when reading or notation was made,
 - 8.1.11 Location of strata changes,
- 8.1.12 Size of casing, depth of cased portion of boring,
- 8.1.13 Equipment and method of driving sampler,
- 8.1.14 Type of sampler and length and inside diameter of barrel (note use of liners).
- 8.1.15 Size, type, and section length of the sampling rods, and
 - 8.1.16 Remarks.
- 8.2 Data obtained for each sample shall be recorded in the field and shall include the following:
- 8.2.1 Sample depth and, if utilized, the sample number,
 - 8.2.2 Description of soil,
 - 8.2.3 Strata changes within sample,
- 8.2.4 Sampler penetration and recovery lengths, and
- 8.2.5 Number of blows per 6-in. (0.16-m) or partial increment.

9. Precision and Bias

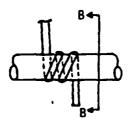
- 9.1 Variations in N-values of 100% or more have been observed when using different standard penetration test apparatus and drillers for adjacent borings in the same soil formation. Current opinion, based on field experience, indicates that when using the same apparatus and driller, N-values in the same soil can be reproduced with a coefficient of variation of about 10%.
- 9.2 The use of faulty equipment, such as an extremely massive or damaged anvil, a rusty cathead, a low speed cathead, an old, oily rope, or massive or poorly lubricated rope sheaves can significantly contribute to differences in N-values obtained between operator-drill rig systems.
- 9.3 The variability in N-values produced by different drill rigs and operators may be reduced by measuring that part of the hammer energy delivered into the drill rods from the sampler and adjusting N on the basis of comparative energies. A method for energy measurement and N-value adjustment is currently under development.



(a) counterclockwise rotation approximately 1% turns



Section A-A

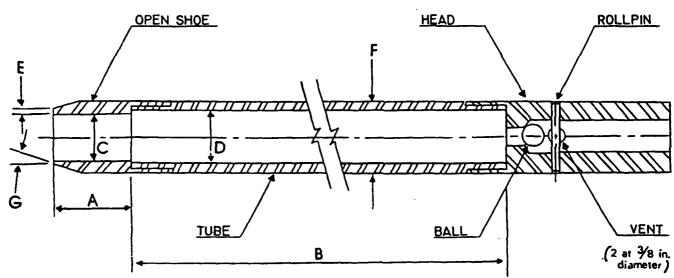


(b) clockwise rotation approximately 2% turns



Section B-B

FIG. 1 Definitions of the Number of Rope Turns and the Angle for (a) Counterclockwise Rotation and (b) Clockwise Rotation of the Cathead



A = 1.0 to 2.0 in. (25 to 50 mm)

B = 18.0 to 30.0 in. (0.457 to 0.762 m)

 $C = 1.378 \pm 0.008$ in. $(34.93 \pm 0.13 \text{ mm})$

 $D = 1.80 \pm 0.08 - 0.00 \text{ in.} (38.1 \pm 1.3 - 0.0 \text{ mm})$

E = 0.10 ± 0.02 in. (2.84 ± 0.25 mm)

 $F = 2.00 \pm 0.08 - 0.00 \text{ in. } (80.8 \pm 1.3 - 0.0 \text{ mm})$

G = 16.0° to 23.0°

The 1% in. (38 mm) inside diameter split barrel may be used with a 16-gage wall thickness split liner. The penetrating end of the drive shoe may be slightly rounded. Metal or plastic retainers may be used to retain soil samples.

FIG. 2 Split-Barrel Sampler

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

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AMERICAN SOCIETY FOR TESTING AND MATERIALS

Standard Practice for

THIN-WALLED TUBE SAMPLING OF SOILS1

This standard is issued under the fixed designation D 1587; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of the last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ξ) indicates an editorial change since the last revision or reapproval.

This practice has been approved for use by agencies of the Department of Defense and for listing in the DOD Index os Specifications and Standards.

1. Scope

1.1 This practice covers a procedure for using a thin-walled metal tube to recover relatively undisturbed soil samples suitable for laboratory tests of structural properties. Thin-walled tubes used in piston, plug, or rotary-type samplers, such as the Denison or Pitcher, must comply with the portions of this practice which describe the thin-walled tubes (5.3).

NOTE 1—This practice does not apply to liners used within the above samplers.

2. Applicable Documents

2.1 ASTM Standards:

D2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)²

D3550 Practice for Ring-Lined Barrel Sampling of Soils²

D4220 Practice for Preserving and Transporting Soil Samples²

3. Summary of Practice

3.1 A relatively undisturbed sample is obtained by pressing a thin-walled metal tube into the in-situ soil, removing the soil-filled tube, and sealing the ends to prevent the soil from being disturbed or losing moisture.

4. Significance and Use

4.1 This practice, or Practice D3550, is used when it is necessary to obtain a relatively undisturbed specimen suitable for laboratory tests of structural properties or other tests that might be influenced by soil disturbance.

Apparatus

5.1 Drilling Equipment—Any drilling equipment may be used that provides a reasonably clean hole; that does not disturb the soil to be sampled; and that does not hinder the penetration of the thin-walled sampler. Open

borehole diameter and the inside diameter of driven casing or hollow stem auger shall not exceed 3.5 times the outside diameter of the thin-walled tube.

5.2 Sampler Insertion Equipment, shall be adequate to provide a relatively rapid continuous penetration force. For hard formations it may be necessary, although not recommended, to drive the thin-walled tube sampler.

5.3 Thin-Walled Tubes, should be manufactured as shown in Fig. 1. They should have an outside diameter of 2 to 5 in. and be made of metal having adequate strength for use in the soil and formation intended. Tubes shall be clean and free of all surface irregularities including projecting weld seams.

5.3.1 Length of Tubes—See Table 1 and 6.4.

5.3.2 Tolerances, shall be within the limits shown in Table 2.

5.3.3 Inside Clearance Ratio, should be 1% or as specified by the engineer or geologist for the soil and formation to be sampled. Generally, the inside clearance ratio used should increase with the increase in plasticity of the soil being sampled. See Fig. 1 for definition of inside clearance ratio.

5.3.4 Corrosion Protection-Corrosion, whether from galvanic or chemical reaction, can damage or destroy both the thin-walled tube and the sample. Severity of damage is a function of time as well as interaction between the sample and the tube. Thin-walled tubes should have some form of protective coating. Tubes which will contain samples for more than 72 h shall be coated. The type of coating to be used may vary depending upon the material to be sampled. Coatings may include a light coat of lubricating oil, lacquer, epoxy, Teflon, and others. Type of coating must be specified by the engineer or geologist if storage will exceed 72 h. Plating of the tubes or alternate base metals may be specified the engineer or geologist.

5.4 Sampler Head, serves to couple the thin-walled tube to the insertion equipment and, together with the thin-walled tube, comprises the thin-walled tube sampler. The sampler head shall contain a suitable check valve and a venting area to the outside equal to or greater than the area through the check valve. Attachment of the head to the tube shall be concentric and coaxial to assure uniform application of force to the tube by the sampler insertion equipment.

6. Procedure

6.1 Clean out the borehole to sampling elevation using whatever method is preferred that will ensure the material to be sampled is not disturbed. If groundwater is encountered, maint the liquid level in the borehole at or above ground water level during the sampling operation.

6.2 Bottom discharge bits are not permitted. Side discharge bits may be used, with caution. Jetting through an open-tube sampler to clean out the borehole to sampling elevation is not permitted. Remove loose material from the center of a casing or hollow stem auger as carefully as possible to avoid disturbance of the material to be sampled.

¹This practice is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.02 on Sampling and Related Field Testing for Soil Investigation.

Current edition approved Aug. 17, 1983. Published October 1983. Originally published as D 1587-587. Last previous edition D 1587-74.

²Annual Book of ASTM Standards, Vol 04.08.

NOTE 2—Roller bits are available in downward-jetting and diffused-jet configurations. Downward-jetting configuration rock bits are not acceptable. Diffuse-jet configurations are generally acceptable.

- 6.3 Place the sample tube so that its bottom rests on the bottom of the hole. Advance the sampler without rotation by a continuous relatively rapid motion.
- 6.4 Determine the length of advance by the resistance and condition of the formation, but the length shall never exceed 5 to 10 diameters of the tube in sands and 10 to 15 diameters of the tube in clays.

NOTE 3—Weight of sample, laboratory handling capabilities, transportation problems, and commercial availability of tubes will generally limit maximum practical lengths to those shown in Table 1.

- 6.5 When the formation is too hard for push-type insertion, the tube may be driven or Practice D3550 may be used. Other methods, as directed by the engineer or geologist, may be used. If driving methods are used, the data regarding weight and fall of the hammer and penetration achieved must be shown in the report. Additionally, that tube must be prominently labeled a "driven sample."
- 6.6 In no case shall a length of advance be greater than the sample-tube length minus an allowance for the sampler head and a minimum of 3 in. for sludge-end cuttings.

NOTE 4—The tube may be rotated to shear bottom of the sample after pressing is complete.

6.7 Withdraw the sampler from the formation as carefully as possible in order to minimize disturbance of the sample.

7. Preparation for Shipment

7.1 Upon removal of the tube, measure the length of sample in the tube. Remove the disturbed material in the upper end of the tube and measure the length again. Seal the upper end of the tube. Remove at least 1 in. of material from the lower end of the tube. Use this material for soil description in accordance with Practice D2488. Measure the overall sample length. Seal the lower end of the tube. Alternatively, after measurement, the tube may be sealed without removal of soil from the ends of the tube if so directed by the engineer or geologist.

NOTE 5—Field extrusion and packaging of extruded samples under the specific direction of a geotechnical engineer or geologist is permitted.

NOTE 6—Tubes sealed over the ends as opposed to those sealed with expanding packers should contain end padding in end voids in order to prevent drainage or movement of the sample within the tube.

7.2 Prepare and immediately affix labels or apply markings as necessary to identify the sample. Assure that the markings or labels are adequate to survive transportation and storage.

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8. Report

- 8.1 The appropriate information is required as follows:
- 8.1.1 Name and location of the project.
- 8.1.2 Boring number and precise location on project,
- 8.1.3 Surface elevation or reference
- 8.1.4 Date and time of boring start and finish,
- 8.1.5 Depth to top of sample and number of samples,
- 8.1.6 Description of sampler: size, type of metal, type of coating,
- 8.1.7 Method of sampler insertion: push or drive,

- 8.1.8 Method of drilling, size of hole, casing, and drilling fluid used,
- 8.1.9 Depth to groundwater level: date and time measured,
- 8.1.10 Any possible current or tidal effect on water level.
- 8.1.11 Soil description in accordance with Practice D2488,
- 8.1.12 Length of sampler advance, and
- 8.1.13 Recovery: length of sample obtained.

9. Precision and Bias

9.1 This practice does not produce numerical data; therefore, a precision and bias statement is not applicable.

TABLE 1 Suitable Thin-Walled Steel Sample Tubes

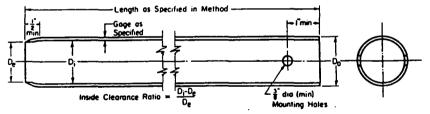
Outside diameter:			
in.	2	3	5
mm	50.8	76.2	127
Wall thickness:			
Bwg	18	16	11
in.	0.049	0.065	0.120
mm	1.24	1.65	3.05
Tube length.			
in.	36	36	64
m	0.91	0.91	1.45
Clearance ratio, %	1	1	1

AThe three diameters recommended in Table 1 are indicated for purposes of standardization, and are not intended to indicate that sampling tubes of intermediate or larger diameters are not acceptable. Lengths of subses shown are illustrative. Proper lengths to be determined as suited to field conditions.

TABLE 2 Dimensional Tolerances for Thir-Walled Tube

Size Outside Diameter	2	3	8 .
Outside diameter	+ 0.007	+0.010	+0.015
	-0.000	-0.000	-0.000
Inside diameter	+0.000	+0.000	+0.000
	- 0.007	-0.010	- 0.016
Wall thickness	±0.007	±0.010	±0.016
Ovality	0.015	0.020	0.030
Straightness	0.030/ft	0.030/ft	0.030/fr

AIntermediate or larger diameters should be proportional. Tolerances shown are essentially standard comercial manufacturing tolerances for seamless steel mechanical tubing. Specify only two of the first three tolerances; that is, 0.D. and I.D., or 0.D. or 0.D. and Wall, or I.D. and Wall.



NOTE 1—Minimum of two mounting holes on opposite sides for 2 to 31/4 in. sampler.

NOTE 2—Minimum of four mounting holes spaced at 90° for samplers 4 in. and larger

NOTE 3-Tube held with hardened screws.

NOTE 4—Two-inch outside-diameter tubes are specified with an 18-gage wall thickness to comply with area ratio criteria accepted for "undisturbed samples." Users are advised that such tubing is difficult to locate and can be extremely expensive in small quantities. Sixteen-gage tubes are generally readily available.

Metric Equivalents

ia.	,ma
•/•	6.77
*	12.7
1	88.4
8	80.8
8%	62.9
4	101.6

FIG. 1 Thin-Walled Tube for Sampling

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	DEP		ELEV		
		FEUSH MOUNTED COVER END OF CAP WITH HOLE		1)	TYPE OF PIPE
		ON STANDPIPE? YESOR NO	/	(PVC, GALVANIZED, STAINLESS, OTHER
		— (IE)OK NO	96.37*	2)	TYPE OF PIPE JOINTS
	0.0'	STANDPIPE	`		BELLED, COUPLINGS, THREADED, OTHER
0		STICKUP		3)	TYPE OF WELL SCREEN PVC., GALVANIZED STAINLESS, OTHER
" -		CONCRETE	l la	4)	SCREEN SLOT SIZE 001 inches
	0.5'	(CROSS OUT IF NOT USED)		5)	SCREEN LENGTH 5 feet
	1	BENTONITE		6)	INSTALLED PROCTECTOR PIPE W/LOCK? YESOR NO
	4	(CROSS OUT IF NOT USED)		7)	DRILLING METHOD Solid Stem Augers
	1	BACKFILL	П		DRILLING FLUID Water
		MATERIAL			BOREHOLE DIAMETER 4 inches
RFACE		CEMENT		8)	BACKFILL MATERIAL INSTALATION FROM SURFACE TREMIE
sui		BENTONITE		9)	HOW WAS WELL DEVELOPED?
QNIC	4.5'	GROUT		(BAILING PUMPING, SURGING, COMPRESSED AIR
TIP OF WELL TO GROUND SURFACE	1.5			10)	APPROXIMATE WATER VOLUME REMOVED OR ADDED? 5 GAL, 10 GAL, 15 GAL, OTHER 4 gals
. WELL		PIPE DIA.		11)	WATER CLARITY BEFORE DEVELOPMENT CLEAR, TURBID, OPAQUE
TIP OF		2IN SCH. <u>40</u>		12)	WATER CLARITY AFTER DEVELOPMENT CLEAR, (TURBID) OPAQUE
		(IF PVC USED) BENTONITE		13)	DID THE WATER SMELL? YES OR (NO)
	3.0'	PELLETS			WATER LEVEL SUMMARY
:		(CROSS OUT IF NOT USED)	7.8	14)	
		(CROSS OUT IF NOTUSED)	•	•	1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT? 13 feet FT OF DRY
	7.0'	CONCRETE SAND	•		2) OTHER MEASUREMENTS: SEE OBSERVATION WELL SUMMARY
15.0'		(CIRCLE ONE)	Q		DATE 9/11/92 , 11.09 FT FROM T, ST. PIPE
15.0			4		DATE, FT FROM T, ST. PIPE
		MATERIAL			DATE, FT FROM T, ST. PIPE
		(CROSS OUT TE NOT DRILLED)	\mathcal{N}		DATE, FT FROM T, ST. PIPE
	اِ	SAND	*Relative	to ben	chmark elevation = 100.00 feet
		ZX	<u> </u>		
WELL N	NON	IW-128 DATE II	NSTALLED	9/5/92	DRILL RIG DR-9
DRILLE	ER	Dumas	DRILL C	REW	Deon
JOB/CL	IENT 1	Proposed NWMH Facility Redevelo	pment Site/Power/CI	RSS	STS PROJECT NO. 27313-XH
(Powe	r/CRSS_	mw-128/m11draw/nt)			(VERSION 3: 08/91 - M11DRAW "FIELD_WELL_KAS")



	DEF	TH FLUSH MOUNTED COVER	ELEV		
		END OF CAP WITH HOLE		,	TYPE OF PIPE
		ON STANDPIPE? (YES) OR NO		(PVC, GALVANIZED, STAINLESS, OTHER
	-		97.26**	2)	TYPE OF PIPE JOINTS
	0.0'	STANDPIPE			BELLED, COUPLINGS, THREADED, OTHER
		STICKUP		3)	TYPE OF WELL SCREEN PVC, GALVANIZED STAINLESS, OTHER
0					
		CONCRETE		4)	SCREEN SLOT SIZE 0-01 inches
	0.5'	(CROSS OUT IF NOT USED)		5)	SCREEN LENGTH 5 feet
		BENTONITE POWDER		6)	INSTALLED PROCTECTOR PIPE W/LOCK? YESOR NO
	,	(CROSS OUT IF NOT OSED)		7)	DRILLING METHOD Solid Stem Augers
i i		,		,	DRILLING FLUID Water
		BACKFILL MATERIAL			BOREHOLE DIAMETER 4 inches
S	ļ	WATERIAL		8)	BACKFILL MATERIAL INSTALATION FROM
TIP OF WELL TO GROUND SURFACE	[. '	CEMENT		٠,	SURFACE TREMIE
IDS .	ļ	BENTONITE		9)	HOW WAS WELL DEVELOPED?
2]	GROUT		- /	BAILING PUMPING, SURGING, COMPRESSED AIR
cou	4.5'			•	2.0
S C				10)	${\bf APPROXIMATE\ WATER\ VOLUME\ REMOVED\ OR\ ADDED?}$
)T					5 GAL, 10 GAL, 15 GAL, OTHER 4 gals
ELI	İ	PIPE DIA.		11)	WATER CLARITY BEFORE DEVELOPMENT
¥.		2 IN.			CLEAR, TURBID (OPAQUE)
P 0	}	SCH. 40		12)	WATER CLARITY AFTER DEVELOPMENT
I	,	(IF PVC USED)			CLEAR, TURBID OPAQUE
		BENTONITE		13)	DID THE WATER SMELL? (YES) OR NO
	3.0'	PELLETS (CROSS OUT IF NOT USED)		14)	WATER LEVEL SUMMARY
		SILICA SAND	78	- 1,	1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
		(CROSS OUT IF NOT USED)	<i>Marie</i>	_	13 feet FT OF DRY
	7.0'	PEA GRAVEL CONCRETE SAND			2) OTHER MEASUREMENTS: SEE OBSERVATION WELL SUMMARY
		ON-SITE SAND			DATE 9/11/92 , 12.85 FT FROM T, ST. PIPE
15.0'	<u> </u>	(CIRCLE ONE)	(<u>Q</u>		DATE FT FROM T, ST. PIPE
	4	MATERIAL	7		DATE FT FROM T, ST. PIPE
		(CROSS OUNE NOT DRILLED)			DATE FT FROM T, ST. PIPE
		SAND	*Relative	e to bene	chmark elevation = 100.00 feet
			\sim		
WELL	VO 1	MW 120 DATE I	VSTALLED !	9/5/92	DRILL RIG DR-9
- ,		Dillon	. 10 17 EDED		DROLL NO
DRILLI	ER	Dumas	DRILL C	REW_	Deon
IOD/O	TEART.	Description of the second	and the second second	000	CTO DO OTO OTO STATE
JOB/CI	TEN I	rtoposed NWMH Facility Redevelo	pment Site/Power/C	K22	STS PROJECT NO27313-XH
(Powe	r/CRSS_	mw-129/m11draw/nt)			(VERSION 3: 08/91 - M11DRAW "FIELD_WELL_KAS")



	DEP	TH COURTED COURT		ELEV		
		FICUSH MOUNTED COVER END OF CAP WITH HOLE ON STANDPIPE?	.=		1)	TYPE OF PIPE
		YES OR NO	\			PVC, GALVANIZED, STAINLESS, OTHER
•	4		尸	96.03'*	2)	TYPE OF PIPE JOINTS BELLED, COUPLINGS, THREADED, OTHER
	0.0'	STANDPIPE STICKUP	!! !!		3)	TYPE OF WELL SCREEN
0		,			3)	PVC., GALVANIZED STAINLESS, OTHER
° -4	4	CONCRETE			4)	SCREEN SLOT SIZE 001 inches
	0.5	(CROSS OUT IF NOT USED)			5)	SCREEN LENGTH5 feet
	1	BENTONITE POWDER			6)	INSTALLED PROCTECTOR PIPE W/LOCK? YESOR NO
	1	(CROSS OUT IF NOT DISED)			7)	DRILLING METHOD Solid Stem Augers
	4					DRILLING FLUID None
		BACKFILL MATERIAL				BOREHOLE DIAMETER 4 inches
SG		WALLER LE	. 1 1 1		8)	BACKFILL MATERIAL INSTALATION FROM
TIP OF WELL TO GROUND SURFACE		<u>CEMENT</u> BENTONITE	.			SURFACE TREMIE
) St		GROUT			9)	HOW WAS WELL DEVELOPED?
IN S					(BAILING PUMPING, SURGING, COMPRESSED AIR
SRO	4.5'		111		10)	APPROXIMATE WATER VOLUME REMOVED OR ADDED?
TO OT					·	5 GAL, 10 GAL, 15 GAL, OTHER 4 gals
3TE					11)	WATER CLARITY BEFORE DEVELOPMENT
, WE		PIPE DIA.			·	CLEAR, TURBID, OPAQUE
90			-		12)	WATER CLARITY AFTER DEVELOPMENT
E	,	SCH. <u>40</u> (IF PVC USED)			,	CLEAR, TURBID OPAQUE
		BENTONITE			13)	DID THE WATER SMELL? (YES) OR NO
	3.0'	PELLETS (CROSS OUT IF NOT USED)			14)	WATER LEVEL SUMMARY
		SILICA SAND			- ',	1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
	- }	(CROSS OUT IF NOT USED)				FT OF DRY
	7.0'	PEA GRAVEL CONCRETE SAND				2) OTHER MEASUREMENTS: SEE OBSERVATION WELL SUMMARY
		ON-SITE SAND (CIRCLE ONE)	14 14			DATE 9/11/92 11.87 FT FROM T, ST. PIPE
15.0'			विव			DATE FT FROM T, ST. PIPE
		CAVE-IN MATERIAL				DATE, FT FROM T, ST. PIPE
	2.0'	(CROSS OUT IF NOT DRILLED)	N			DATE, FT FROM T, ST. PIPE
		SAND		*Relative	to ben	chmark elevation = 100.00 feet
17.0'		<u> </u>	7	Ĺ		
WELL 1	1 0	MW-130 DATE	INST	ALLED_9	/5/92	DRILL RIG
DRILLI	ER	Dumas		_ DRILL CI	REW	Deon
JOB/CL	JENT:	Proposed NWMH Facility Redev	elopmen'	t Site/Power/CR	SS	STS PROJECT NO. 27313-XH
		S_MW-130/M11DRAW/NT)				(VERSION 3: 08/91 - M11DRAW "FIELD_WELL_KAS")
\~ = \·						(AEUGICIA 2: DOST - WITDLWAA LIEFD AAETT W2)



	DEF	TH COVER	<u>ELEV</u>		
		FEUSH MOUNTED COVER END OF CAP WITH HOLE ON STANDPIPE?		1)	TYPE OF PIPE PVC, GALVANIZED, STAINLESS, OTHER
		YESOR NO	,	2)	TYPE OF PIPE JOINTS
	4	STANDPIPE	96.5'*	•	BELLED, COUPLINGS, THREADED, OTHER
	0.0'	STICKUP		3)	TYPE OF WELL SCREEN
0	,				PVC, GALVANIZED STAINLESS, OTHER
	1	CONCRETE	9	4)	SCREEN SLOT SIZE0.01_inches
	0.5'	(CROSS OUT IF NOT USED)		5)	SCREEN LENGTH 5 feet
		BENTONITE		6)	INSTALLED PROCTECTOR PIPE W/LOCK? YESOR NO
	1	(CROSS OUT IF NOT USED)		7)	DRILLING METHOD Solid Stem Augers
			1	•	DRILLING FLUID None
		BACKFILL MATERIAL			BOREHOLE DIAMETER 4 inches
CE		WATERIAL	1	8)	BACKFILL MATERIAL INSTALATION FROM
RFA		CEMENT BENTONITE		-,	SURFACE TREMIE
ns		GROUT		9)	HOW WAS WELL DEVELOPED?
	5.0'			. (BAILING PUMPING, SURGING, COMPRESSED AIR
ROL				10\	
TIP OF WELL TO GROUND SURFACE				10)	APPROXIMATE WATER VOLUME REMOVED OR ADDED? 5 GAL, 10 GAL, 15 GAL, OTHER 4 gals
רדו				11)	WATER CLARITY BEFORE DEVELOPMENT
WE		PIPE DIA.		11)	CLEAR, TURBID OPAQUE
0F		_2IN		12)	WATER CLARITY AFTER DEVELOPMENT
TIP		sch. <u>40</u>		12)	CLEAR, (TURBID) OPAQUE
	-	(IF PVC USED) BENTONITE		13)	DID THE WATER SMELL? YES OR NO
	3.0'	PELLETS (CROSS OUT IF NOT USED)		14)	WATER LEVEL SUMMARY
				14)	
		(CROSS OUT IF NOT USED)			1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT? 13 FT OF DRY
	7.0'	PEA GRAVEL CONCRETE SAND	;		2) OTHER MEASUREMENTS: SEE OBSERVATION WELL SUMMARY
		ON-SITE SAND]		DATE 9/11/92 , 12.22 FT FROM T, ST. PIPE
15.0'	*	(CIRCLE ONE)	4		DATE FT FROM T, ST. PIPE
	1	CAVE-IN MATERIAL	1		DATE FT FROM T, ST. PIPE
	1.5'	(CROSS OUT IF NOT DRILLED)	t e		DATE FT FROM T, ST. PIPE
		SAND	*Relative	to ben	chmark elevation = 100.00 feet
17.0'			7		<i>'</i>
WELL N	40 I	MW_131 DATE INST	CALLED 9	/5/92	DRILL RIG DR-9
1		DAID MO.			
DRILLE	ER	Dumas	_ DRILL CR	REW_	Deon
JOB/CI	JENT 1	Proposed NWMH Facility Redevelopme	nt Site/Power/CR:	SS	STS PROJECT NO27313-XH
					
(PC	OWER/C	RSS_MW-131/M11DRAW/NT)			(VERSION 3: 08/91 - M11DRAW "FIELD_WELL_KAS")

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Sample ID: TP-1

 $\langle \cdot \rangle$

VOLATILES	Method:	8W-846	8240	(Modified to	capillary)
Parameter				MDL	-	Analysis
				mg/I	Kg	mg/Kg
		•				
1,1-Dichlo				0.00		BDL
1,1-Dichlo	roethene			0.00		BDL
1,1,1-Tric				0.00		BDL
1,1,2-Tric				0.00		BDL
1,1,2,2-Te		ethane		0.00		BDL
1,2-Dichlo				0.00		BDL
1,2-Dichlo				0.00		BDL
1,2,3-Tric				0.00		BDL
1,4-Dichlo		ne		0.00		BDL
2-Butanone		4.3		0.29		BDL
2-Chloroet		etner		0.00		BDL
2-Hexanone		(),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		0.0		BDL
4-Methyl-2	-pentanon	e(WIRK)		0.0		BDL
Acetone				0.3		BDL
Acrolein	_ • • -			0.0		BDL
Acrylonit	cite			0.0		BDL
Benzene		_		0.0		BDL
Bromodichl		ie		0.0		BDL
Bromometha				0.0		BDL
Carbon dis				0.0		BDL
Chlorobenz				0.0		BDL
Chloroetha				0.0		BDL
Chlorometh				0.0		BDL
cis-1,3-Di				0.0		BDL
Dibromoch		ine		0.0		BDL
Dibromomet		•		0.0		BDL
Dichlorod:		inane		0.0		BDL
Ethylbenze				0.0		BDL BDL
Iodomethan				0.0		BDL
Methylben		luene		0.0		
Methylene	culoride			0.0		BDL BDL
Styrene				0.0		0.044
Tetrachlo				0.0		BDL
Tetrachlo				0.0		BDL
trans-1,2				0.0		BDL
trans-1,3				0.0		BDL
Tribromome		comororn	()	0.0		0.023
Trichloro				0.0		
Trichloro				0.0		BDL
Trichloro	•	TUTOLOIC	rm)	0.0		BDL
Vinyl ace				0.1		BDL
Vinyl chl				0.0		BDL
Xylenes (Total)			. 0.0	172	\mathtt{BDL}

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Sample ID: TP-2

VOLATILES Method: 8	W-846 8240	(Modified to	capillary)
Parameter		MDL	Analysis
		mg/Ko	g mg/Kg
			- 757
1,1-Dichloroethane		0.00	
1,1-Dichloroethene		0.00	
1,1,1-Trichloroethane		0.00	
1,1,2-Trichloroethane 1,1,2,2-Tetrachloroethane		0.00	
1,2-Dichloroethane	Lilane	0.00	
1,2-Dichloropropane		0.00	
1,2,3-Trichloropropa	20	0.00	
1,4-Dichloro-2-butene		0.00	
2-Butanone (MEK)	•	0.25	
2-Chloroethyl vinyl	ether	0.00	
2-Hexanone	J 41101	0.05	
4-Methyl-2-pentanone	(MIBK)	0.02	
Acetone	(,	0.38	
Acrolein		0.00	
Acrylonitrile		0.00	
Benzene		0.00	
Bromodichloromethane		0.00	
Bromomethane		0.02	5 BDL
Carbon disulfide		0.00	5 BDL
Chlorobenzene		0.00	5 BDL
Chloroethane		0.02	5 BDL
Chloromethane		0.02	5 BDL
cis-1,3-Dichloroprop		0.00	
Dibromochloroemethan	e	0.00	
Dibromomethane		0.00	
Dichlorodifluorometh	ane	0.00	
Ethylbenzene		0.00	
Iodomethane		0.00	
Methylbenzene (Tolu-	ene)	0.00	
Methylene chloride		0.00	
Styrene	•	0.00	
Tetrachloroethene		0.00	
Tetrachloromethane	L	0.00	_
trans-1,2-Dichloroeth		0.00	
trans-1,3-Dichloropro	opene	0.00	
Tribromomethane (Bro	mororm)	0.00	
Trichloroethene Trichlorofluorometha		0.00	
		0.00	
Trichloromethane (Chi	rorororm)	0.00	
Vinyl acetate		0.13	•
Vinyl chloride		0.02	
Xylenes (Total)		0.01	5 BDL

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Sample ID: TP-3

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VOLATILES	Method:	8W-846	8240	(Modified to	capillary)
Parameter				MDL	Analysis
				mg/Kg	mg/Kg
1,1-Dichlo				0.005	
1,1-Dichlo				0.005	
1,1,1-Tric				0.005	
1,1,2-Tric				0.005	
1,1,2,2-Te		etnane		0.005	
1,2-Dichlo				0.005	
1,2-Dichlo				0.005	
1,2,3-Tric				0.005 0.005	
1,4-Dichlo		ne		0.00	5 BDL BDL
2-Butanone		other		0.25	
2-Chloroet 2-Hexanone		erner		0.05	
		~ (MTDV)		0.02	
4-Methyl-2	-pentanon	e(MIDV)		0.02	BDL
Acetone					
Acrolein				0.00	
Acrylonitr	TIE			0.00!	
Benzene				0.00	
Bromodichl		e		•	
Bromometha				0.02	
Carbon dis				0.00	
Chlorobenz				0.00	
Chloroetha				0.02	
Chlorometh				0.02	
cis-1,3-Di				0.00	
Dibromochl		ine		0.00	
Dibromomet		hana		0.00	
Dichlorodi		nane		0.00	
Ethylbenze Iodomethar				0.00	
Methylbenz				0.00	
Methylene		.uene)		0.00	
Styrene	curoride			0.00	
Tetrachlo	coathana			0.00	
Tetrachlor				0.00	
trans-1,2-		thono		0.00	-
trans-1,3				0.00	
			,	0.00	
Tribromome Trichloroe		OMOTORM	1	0.00	
Trichloro		220		0.00	
)	0.00	
Trichloron		HITOLOLO	TIII)	0.00	
Vinyl acet					
Vinyl chlo				0.02	
Xylenes (rotal)			0.01	5 BDL

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BDL

Sample ID: TP-3 (cont'd)

TCLP METALS

PCBs:

Method: Standard Method

Parameter	•	MDL	(mg/L)	Analysis	(mg/L)
Arsenic Cadmium Chromium Lead Selenium Silver Barium Mercury		0.2 0.1 0.1 0.1 0.2 0.1 0.1	5	BDL BDL BDL BDL BDL 0.3 BDL	
Method:	GC/ECD				

0.5 mg/Kg

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Sample ID: TP-4

VOLATILES	Method:	8W-846	8240	(Modified t	o capillary))
Parameter				MDL		Analysis
				mg/	Kg	mg/Kg
1,1-Dichlo				0.0		BDL
1,1-Dichlo				0.0		BDL BDL
1,1,1-Tric				0.0		BDL
1,1,2-Tric				0.0		BDL
1,1,2,2-Te 1,2-Dichlo		echane		0.0		BDL
1,2-Dichlo				0.0		BDL
1,2-Dichio				0.0		BDL
1,4-Dichlo				0.0		BDL
2-Butanone				0.2		BDL
2-Chloroet		ether		0.0		BDL
2-Hexanone		001101		0.0		BDL
4-Methyl-2		e(MTBK)		0.0		BDL
Acetone	ponounon.	· (112211)		0.3		BDL
Acrolein				0.0		BDL
Acrylonitr	ile			0.0		BDL
Benzene				0.0		BDL
Bromodichl	oromethan	e		0.0		BDL
Bromometha				0.0		BDL
Carbon dis				0.0		0.014
Chlorobenz				0.0		BDL
Chloroetha				0.0		\mathtt{BDL}
Chlorometh				0.0		\mathtt{BDL}
cis-1,3-Di		pene		0.0		BDL
Dibromochl				0.0	05	BDL
Dibromomet				0.0		\mathtt{BDL}
Dichlorodi		hane		0.0		\mathtt{BDL}
Ethylbenze	ene			0.0	005	\mathtt{BDL}
Iodomethar				0.0	005	\mathtt{BDL}
Methylbenz	ene (Tol	uene)		0.0	005	BDL
Methylene	chloride	•		0.0	005	\mathtt{BDL}
Styrene				0.0	005	\mathtt{BDL}
Tetrachlor	coethene			0.0	005	\mathtt{BDL}
Tetrachlor				0.0	005	0.014
trans-1,2-					005	\mathtt{BDL}
trans-1,3-					005	\mathtt{BDL}
Tribromome	ethane (Br	comoform	1)	0.0	005	\mathtt{BDL}
Trichloroe					005	BDL
Trichlorof	fluorometh	ane			005	\mathtt{BDL}
Trichloron	methane (C	chlorofo	rm)		005	\mathtt{BDL}
Vinyl acet				0.3		\mathtt{BDL}
Vinyl chlo	oride				025	\mathtt{BDL}
Xylenes (rotal)			0.0	015	\mathtt{BDL}

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Sample ID: TP-6

VOLATILES	Method:	8W-846	8240	(Modified to	capillary)	
Parameter				MDL	Analysi	is
				mg/K	g mg/Kg	
				0.00	r DDT	
1,1-Dichlo				0.00 0.00		
1,1-Dichlo				0.00		
1,1,1-Tric				0.00		
1,1,2-Tric				0.00		
1,1,2,2-Te		ethane		0.00		
1,2-Dichlo				0.00	-	
1,2-Dichlo				0.00		
1,2,3-1110 1,4-Dichlo				0.00		
2-Butanone		iie		0.25		
2-Chloroet	: (MEA) ·bul winul	ether		0.00		
2-Hexanone		. ecner		0.05		
4-Methyl-2		A (MTRK)		0.02		
Acetone	-pericanor	ie (middic)		0.38		
Acrolein				0.00		
Acrylonit	rile			0.00		
Benzene	. 110			0.00		
Bromodichl	oromethar	ne.		0.00		
Bromometha		.0		0.02		
Carbon dis				0.00		
Chlorobenz				0.00		
Chloroetha				0.02	5 BDL	
Chlorometh				0.02	5 BDL	
cis-1,3-Di		pene		0.00	5 BDL	•
Dibromoch				0.00	5 BDL	
Dibromomet				0.00		
Dichlorodi		thane		0.00	5 BDL	
Ethylbenze				0.00		
Iodomethar				0.00		
Methylbena	zene (To:	luene)		0.00		
Methylene				0.00		
Styrene				0.00		
Tetrachlo	roethene			0.00		
Tetrachlo				0.00		
trans-1,2	-Dichloro	ethene		0.00		
trans-1,3				0.00		
Tribromome		romoform	1)	0.00		
Trichloro		-		0.00	•	
Trichloro				0.00		
Trichloro	•	Chlorofo	orm)	0.00		
Vinyl ace				0.13	and the second s	
Vinyl chlo				0.02		
Xylenes (Total)			0.03	L5 BDL	

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MDL = Method Detection Limit
BDL = Below Detection Limit

Respectfully submitted,

Douglas Weir, Ph.D. Lab Director

Quality Analytical Labs, Inc.

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CLIENT STS CONSULTANTS

JOB NO. CH920797

PROJECT NO. 27313-XH

METHOD: 8240 SOIL

EPA TARGET COMPOUND LIST (TCL)
VOLATILE COMPOUNDS

ug/kg

Dilution Factor (DF) Method Blank Client I.D.	108	1 VS0802 METHOD BLANK		Lower Limits Quantitation (LLD) with no Dilution*
	108	METHOD		(LLD) with
Client I.D.				1110 DIII
Compound Lab I.D.	20797 001	VS0802		
Chloromethane	U	U		10
Bromomethane '	U	U		10
Vinyl Chloride	U	U		10
Chloroethane	U	Ü		10
Methylene Chloride	U	U		5
Acetone	31	Ü		10
Carbon Disulfide	<u>U</u>	Ŭ		5
1,1-Dichloroethene	บ	U		5
1,1-Dichloroethane	ט	Ū		5
trans-1,2-Dichloroethene	U	บ		5
Chloroform	Ū	Ū		5
1,2-Dichloroethane	U	Ū		5
2-Butanone	U	Ü		10
1,1 1-Trichlorethane	U	Ū		5
Carbon Tetrachloride	U	U		5
Vinyl Acetate	U	Ü		10
Bromodichloromethane	U	Ü		5
1,2-Dichloropropane	Ü	Ü		5
Trans-1,3-dichloropropene	Ü	Ü		5
Trichloroethylene	Ü	Ü		5
Dibromochloromethane	Ü	Ü		5
1,1, 2-Trichloroethane	Ü	Ü		5
Benzene	Ü	Ü		5
cis-1, 3-Dichloropropene	บ	Ü		5
2-Chloroethylvinylether	Ü	Ü		5
Bromoform	Ü	Ü		5
4-Methyl-2-Pentanone	Ü	Ū		10
2-Hexanone	U	Ü		10
Tetrachloroethylene	Ū	Ū		5
1,1,2,2-Tetrachloroethane	Ü	Ŭ		5
Toluene	6	ט	 	. 5
Chlorobenzene	Ü	Ü	 	5
Ethylbenzene	86	U		5
Styrene Styrene	U U	U	 	5
Total Xylenes	240	บ	 	5
TOCAL VATERIES	240			

^{*}MDL (Minimum Detection Limit) = LLD x DF



POLYNUCLEAR AROMATIC HYDROCARBONS (PNA) SW-846 METHOD 8310-SPECIAL

CLIENT: STS CONSULTANTS DATE RECEIVED: 07/29/92 CLIENT PROJECT ID: 27313-XH DATE SAMPLED: 07/28/92 **IEA PROJECT ID:** CH920797 DATE EXTRACTED: 08/02/92 20797001 DATE ANALYZED: 08/12/92 IEA SAMPLE ID: LAWHON **ANALYSIS BY:** CLIENT SAMPLE ID: 108 **DILUTION FACTOR:** MATRIX: SOIL 5.0

		Quantitation Limit	Results Concentration	
Number	Compound	(ug/kg)	(ug/kg)	
1	Naphthalene	660	BQL	
2	Acenaphthylene	660	5800	
3	Acenaphthene	1200	BQL	
4	Fluorene	140	18000	
5	Phenanthrene	660	6000	
6	Anthracene	660	21000	
7	Fluoranthene	660	38000	
8	Pyrene	180	12000	
9	Benzo(a)anthracene	8.7	1300	
10	Chrysene	100	1500	
11	Benzo(b)fluoranthene	11	BQL	
12	Benzo(k)fluoranthene	11	130	
13	Benzo(a)pyrene	15	300	
14	Dibenzo(a,h)anthracene	20	BQL	
15	Benzo(g,h,i)perylene	51	300	
16	Indeno(1,2,3-cd)pyrene	29	BQL	

Comments:

Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit



POLYNUCLEAR AROMATIC HYDROCARBONS (PNA) SW-846 METHOD 8310-SPECIAL

N/A CLIENT: STS CONSULTANTS DATE RECEIVED: N/A **CLIENT PROJECT ID:** 27313-XH DATE SAMPLED: 08/02/92 **IEA PROJECT ID:** CH920797 DATE EXTRACTED: **IEA SAMPLE ID:** 610 B 477 DATE ANALYZED: 08/04/92 METHOD BLANK ANALYSIS BY: LAWHON CLIENT SAMPLE ID: **DILUTION FACTOR:** 1.0 MATRIX: SOIL

Number	Compound	Quantitation Limit (ug/kg)	Results Concentration (ug/kg)
1	Naphthalene	660	BQL
2	Acenaphthylene	660	BQL
3	Acenaphthene	1200	BQL
4	Fluorene	140	BQL
5	Phenanthrene	660	BQL
6	Anthracene	660	BQL
7	Fluoranthene	660	BQL
8	Pyrene	180	BQL
9	Benzo(a)anthracene	8.7	BQL
10	Chrysene	100	BQL
11	Benzo(b)fluoranthene	11	BQL
12	Benzo(k)fluoranthene	11	BQL
13	Benzo(a)pyrene	15	BQL
14	Dibenzo(a,h)anthracene	20	BQL
15	Benzo(g,h,i)perylene	51	BQL
16	Indeno(1,2,3-cd)pyrene	29	BQL

Comments:

Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit



IEA PROJECT# CH920797
CLIENT PROJECT ID 27313-XH
MATRIX SOIL

TOTAL PETROLEUM HYDROCARBONS EPA METHOD 418.1 mg/kg

CLIENT ID	108	METHOD	
· ·		BLANK	
LAB ID	20797		PQL
	001	TS0730	
T. Petroleum Hydrocarbons	38	< 20	20
DATE EXTRACTED	07/30/92	07/30/92	
DATE SAMPLED	07/28/92		
DATE ANALYZED	08/04/92	08/04/92	•
DILUTION FACTOR	1	1	



IEA PROJECT# CH920797
CLIENT PROJECT ID 27313-XH
MATRIX SOIL

OIL & GREASE EPA METHOD 418.1 mg/kg

CLIENT ID	108	METHOD	•	
		BLANK		
LAB ID	20797			PQL
	001	TS0730		
OIL & GREASE	38	< 20		20
DATE EXTRACTED	07/30/92	07/30/92		
DATE SAMPLED	07/28/92			
DATE ANALYZED	08/04/92	08/04/92		
DILUTION FACTOR	1	1		



POLYNUCLEAR AROMATIC HYDROCARBONS (PNA) SW-846 METHOD 8310-SPECIAL

CLIENT: ST
CLIENT PROJECT ID: 273
IEA PROJECT ID: CH

MATRIX:

STS CONSULTANTS 27313-XH CH920792 20792002 DATE RECEIVED: DATE SAMPLED: DATE ANALYZED:

Quantitation

07/28/92 07/27/92 08/05/92

IEA SAMPLE ID: CLIENT SAMPLE ID:

109 SOIL DILUTION FACTOR: 100

Results Concentration

Number	Compound	Limit (ug/kg)	Concentration (ug/kg)
1	Naphthalene	6600	BQL
2	Acenaphthylene	6600	BQL
3	Acenaphthene	10000	54000
4	Fluorene	1900	BQL
5	Phenanthrene	500	BQL
6	Anthracene	400	7500
7	Fluoranthene	130	25000
8	Pyrene	1800	BQL
9	Benzo(a)anthracene	30	950
10	Chrysene	200	770
11	Benzo(b)fluoranthene	0.60	BQL
12	Benzo(k)fluoranthene	20	120
13	Benzo(a)pyrene	30	230
14	Indeno(1,2,3-cd)pyrene	290	BQL
15	Dibenzo(a,h)anthracene	60	BQL
16	Benzo(g,h,i)perylene	130	BQL

Comments:

Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit



STS CONSULTANTS CLIENT

JOB NO. <u>CH920792</u> PROJECT NO. <u>27313-XH</u>

METHOD: 8240 SOIL

EPA TARGET COMPOUND LIST (TCL) VOLATILE COMPOUNDS

ug/kg

		ug/K	 -			
Dilution Factor (DF)	1	5	1	1	1	Lower Limits Quantitation
Method Blank	VS0731	VS0802	VS0731	VS0731	VS0802	
Client I.D.	115	109	118	METHOD BLANK	METHOD BLANK	no bilacion.
Compound Lab I.D.	20792 001	20792 002	20792 003	VS0731	VS0802	
Chloromethane	U	UD	U	Ū	U	10
Bromomethane '	U	UD	U	U	U	10
Vinyl Chloride	U	UD	บ	U	U	10
Chloroethane	U	UD	Ū	Ū	U	10
Methylene Chloride	U	UD	U	U	U	_5
Acetone	16	UD	U	U	U	10
Carbon Disulfide	U	UD	บ	บ	υ	5
1,1-Dichloroethene	U	UD	Ū	U	บ	5
1,1-Dichloroethane	U	UD	บ	ט	U	5
trans-1,2-Dichloroethene	บ	UD	บ	U	U	5
Chloroform	Ü	UD	U	U	U	5
1,2-Dichloroethane	Ū	UD	Ū	Ü	Ü	5
2-Butanone	U	UD	Ū	Ū	Ü	10
1,1 1-Trichlorethane	Ū	UD	Ü	Ü	Ü	5
Carbon Tetrachloride	Ü	UD	Ū	Ü	Ū	5
Vinyl Acetate	Ü	UD	Ü	Ü	Ū	10
Bromodichloromethane	Ü	UD	Ü	Ü	Ū	5
1,2-Dichloropropane	Ü	UD	U	Ü	U	5
Trans-1,3-dichloropropene	Ü	UD	Ü	Ū	Ü	5
Trichloroethylene	U	UD	U	Ü	Ū	5
Dibromochloromethane	U	UD	Ū	Ü	Ü	5
1,1, 2-Trichloroethane	Ū	UD	Ū	Ū	Ü	5
Benzene	U	UD	บ	Ü	Ü	5
cis-1, 3-Dichloropropene	U	UD	Ü	Ü	Ü	5
2-Chloroethylvinylether	Ü	UD	Ü	Ü	Ü	5
Bromoform	Ü	UD	Ū	Ü	Ü	5
4-Methyl-2-Pentanone	Ü	UD	Ü	Ŭ	Ü	10
2-Hexanone	Ü	UD	Ü	Ū	Ū	10
Tetrachloroethylene	Ü	UD	Ü	Ü	Ū	5
1,1,2,2-Tetrachloroethane	ט	UD	Ü	Ü	Ü	5
Toluene	Ü	UD	Ü	Ü	Ŭ ·	5
Chlorobenzene	U	UD	Ü	Ü	Ü	5
Ethylbenzene	14	UD	Ü	Ü	บ	5
Styrene	U	UD	Ü	Ü	Ü	5
Total Xylenes	180	89	10	Ü	Ü	5
TOUR AFTERIES	100	0.5	1			
				<u> </u>		

^{*}MDL (Minimum Detection Limit) = LLD x DF



IEA PROJECT# CH920792 CLIENT PROJECT ID 27313-XH MATRIX SOIL

TOTAL PETROLEUM HYDROCARBONS EPA METHOD 418.1 mg/kg

CLIENT ID	115	109	118	METHOD BLANK	
LAB ID	20792 001	20792 002	20792 003	TS0730	PQL
T. Petroleum Hydrocarbons	31	13000	- 21	< 20	20
DATE EXTRACTED DATE SAMPLED DATE ANALYZED DILUTION FACTOR	07/30/92 07/27/92 08/04/92	07/30/92 07/24/92 08/04/92 100	07/30/92 07/27/92 08/04/92	2	



POLYNUCLEAR AROMATIC HYDROCARBONS (PNA) SW-846 METHOD 8310-SPECIAL

STS CONSULTANTS DATE RECEIVED: CLIENT: 07/28/92 **CLIENT PROJECT ID:** 27313-XH DATE SAMPLED: 07/27/92 **IEA PROJECT ID:** CH920792 DATE ANALYZED: 08/05/92 20792001 **DILUTION FACTOR: IEA SAMPLE ID:** 1.0

CLIENT SAMPLE ID: 115
MATRIX: SOIL

	Our and	Quantitation Limit	Results Concentration
Number	Compound	(ug/kg)	(ug/kg)
1	Naphthalene	100	BQL
2	Acenaphthylene	200	BQL
3	Acenaphthene	100	BQL
4	Fluorene	20.0	BQL
5	Phenanthrene	5.0	11
6	Anthracene	4.00	4.0
7	Fluoranthene	1.30	BQL
8	Pyrene	20.0	BQL
9	Benzo(a)anthracene	0.30	BQL ·
10	Chrysene	2.00	BQL
11	Benzo(b)fluoranthene	0.60	BQL
12	Benzo(k)fluoranthene	0.20	0.70
13	Benzo(a)pyrene	0.30	0.95
14	Indeno(1,2,3-cd)pyrene	20.0	BQL
15	Dibenzo(a,h)anthracene	0.60	BQL
16	Benzo(g,h,i)perylene	1.30	BQL

Comments:

Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit



POLYNUCLEAR AROMATIC HYDROCARBONS (PNA) SW-846 METHOD 8310-SPECIAL

CLIENT: STS CONSULTANTS DATE RECEIVED: 07/28/92
CLIENT PROJECT ID: 27313-XH DATE SAMPLED: 07/27/92
IEA PROJECT ID: CH920792 DATE ANALYZED: 08/05/92
IEA SAMPLE ID: 20792003 DILUTION FACTOR: 1.0

IEA SAMPLE ID: 20792003 DILUTION FACTOR: CLIENT SAMPLE ID: 118
MATRIX: SOIL

		Quantitation Limit	Results Concentration
Number	Compound	(ug/kg)	(ug/kg)
Ì	Naphthalene	100	BQL
2	Acenaphthylene	200	BQL
3	Acenaphthene	100	BQL
4	Fluòrene	20.0	BQL
5	Phenanthrene	5.0	25
6	Anthracene	4.00	8.1
7	Fluoranthene	1.30	BQL
8	Pyrene	20.0	22
9	Benzo(a)anthracene	0.30	8.7
10	Chrysene	2.00	21
11	Benzo(b)fluoranthene	0.60	6.6
12	Benzo(k)fluoranthene	0.20	5.8
13	Benzo(a)pyrene	0.30	13
14	Indeno(1,2,3-cd)pyrene	20.0	BQL
15	Dibenzo(a,h)anthracene	0.60	BQL
16	Benzo(a.h.i)perviene	1.30	BQL

Comments:

Sample specific quantitation limits may be calculated by multiplying the quantitation limit by the dilution factor.

BQL = Below Quantitation Limit



IEA PROJECT# CH920792 CLIENT PROJECT ID 27313-XH MATRIX SOIL

OIL & GREASE EPA METHOD 418.1 mg/kg

CLIENT ID	115	109	118	METHOD BLANK	
LAB ID	20792	20792	20792		PQL
	. 001	002	003	TS0730	
OIL & GREASE	37	14000	31	< 20	
DATE EXTRACTED	07 <i>/</i> 30/92	07/30/92	07/30/9	2 07/30/92	
DATE SAMPLED	07/27/92	07/24/92	07/27/9	2	
DATE ANALYZED	08/04/92	08/04/92	08/04/9	2 08/04/92	
DILUTION FACTOR	1	100	1	1	

															
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Distribution: Original and Green - Laboratory Yellow - As needed Pink - Transporter Goldenrod - STS Project File Instruction to Laboratory: Forward completed original to STS with analytical results. Retain green copy.

Г З sтs сн	AIN (OF C	U	STO	OD	Y REC	CC	RI)			№ 14609 re	CORD NO	THROUGH
Phone No. <u>272-6520 2326 (2088)</u> Project No. <u>273/3-4 H</u> PO No.								بر — —	8P		RUSH Contact Person Phone No. (708) 705-0740		• • • • • • • • • • • • • • • • • • • •	
Sample I.D.	Date	Time	Grab	Composite	No. of Containers	Sample Type (Water, soil, air, sludge, etc.)	Preservation	J 🔑	/FID	J Dat		Analysis Request	Comme	nts on Sample ljor Contaminants)
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on: Original and Green Laboratory Yellow – As needed Pink – Transposition Goldenrod – STS Project File instruction to Laboratory: Forward completed original to STS with analytical results. Retain green copy.



Analytical Methodology

IEA utilizes approved environmental methodologies whenever possible and appropriate. Due to the varying nature of sample matrices submitted to our laboratories we utilize a wide variety of analytical methodologies and quality assurance protocols. Analytical results and Quality Assurance protocols employed by our network laboratories are based on guidelines specified in the following documents:

- "Methods of Organic Chemical Analysis of Municipal and Industrial Wastewater", Federal Register Vol. 49, No. 209, October 26, 1984;
- "Test Methods for Evaluating Solid Waste", SW-846 Third Edition, September 1986, USEPA;
- "Standard Methods for the Examination of Water and Wastewater" 1985, 14th, 15th and 16th Edition;
- "Methods for Chemical Analysis of Water and Wastes" March 1983, EMSL, EPA;
- "Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples", EPA 600/8-80-038, June 1980;
- Organic Analysis: Multi-media, Multi-Concentration-IFB-CLP, January 1991, Document Number OLM01.2 (plus revisions);
- Inorganic Analysis: Multi-media, Multi-Concentration-IFB-CLP, Document Number ILM01.0;
- "Handbook for Analytical Quality Control in Water and Wastewater Laboratories", EPA-600/4-79-019, March 1979;
- National Enforcement Investigation Center Policies and Procedures Manual, EPA-330/9/78/001-R, Revised May 1986
- "Manual for the Certification of Laboratories Analyzing Drinking Water", April 1990, EPA/570/9-90/008.

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State Certifications

In some instances it may be necessary for environmental data to be reported to a regulatory authority with reference to a certified laboratory. For your convenience, the laboratory identification numbers for the IEA-Illinois laboratory are provided in the following table. Many states certify laboratories for specific parameters or tests within a category (ie. method 624 for wastewater). The information in the following table indicates the lab is certified in a general category of testing such as drinking water or wastewater analysis. The laboratory should be contacted directly if parameter specific certification information is required.

IEA-Illinois Certification Summary, as of June 1992

State	Responsible Agency	Area of Certification	Lab Number
Connecticut	Department of Health Services	General Environmental	PH-0672
Illinois	Environmental Protection Agency	Drinking Water	100238
Tennessee	Department of Health and Environment.	Drinking Water	02962
Wisconsin	Department of Natural Resources	General Environmental	999756670

Doc#-RPF00100.II



Definitions of Data Qualifiers and Terminology

There are a number of data qualifiers that are widely used within the environmental testing industry which may be utilized in our data reports. The following definitions of these qualifiers are included as a service to our clientele. The majority of the qualifiers have evolved from the EPA contract laboratory program (CLP) therefore, they may or may not be appropriate for the particular testing that you have requested. If your work did not involve CLP type analyses, only a few of these items may apply to your particular report.

- A This flag is utilized to indicate that a tentatively identified compound (TIC) is a suspected aldolcondensation product formed during sample processing and caution should be applied in interpreting these results.
- B This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to use caution when applying the results of this analyte.
- BQL Below quantitation limit indicates the compound was not detected in the sample above the practial quantitation limit.
- C Indicates that a pesticide identification has been confirmed utilizing GC/MS techniques.
- D Indicates the sample extract was diluted by the factor listed due to the sample matrix and/or concentration levels. All method detection limits or practical quantitation limits for the particular sample are therefore increased by this dilution factor.
- E Indicates that the concentration of the specific compound exceeded the calibration range of the instrument for that particular analysis.
- J Indicates an estimated value. It indicates that the compound was analyzed for and determined to be present in the sample. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meet the identification criteria but the result is less than the sample quantitation limit but greater than zero.
- MDL The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
- ND Indicates the compound or analyte was not detected in the sample above the method detection limit or the practical quantitation limit for the particular analysis.
- PQL The practical quantitation limit is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine operating conditions.
- U Indicates the compound was analyzed for but not detected in the sample above the applicable quantitation limit.

Doc#-RPF00300.NET



CASE NARRATIVE CH920792

Sample 109 required dilution due to high levels of hydrocarbons. PNA analysis was subcontracted because the initial request for 48 hour TAT could not be met internally. All samples were handled under internal and external chain of custody.

The turnaround time requested was changed to standard 2 weeks by Steve Bucher.

(mg/L)



Project #: 920476 09/17/92 Date

STS Consultants Ltd. 1869 Techny Road Northbrook, IL 60062

ATTN: Dave Grumman

Sampling Date: 09/05,06/92 Analyses Date: 09/08-17/92

Identification:

Nine samples taken by Robert Bryce identified

PROJECT #27313-XH STS/C.O.C. \$14658

Completed report.

Results follow:

Sample ID: B-126

TCLP METALS

Method: Standard Method

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.1	BDL
Chromium	0.1	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.1	BDL
Barium	0.1	1.0
Mercury	0.05	BDL

Sample ID: B-128

TCLP METALS

Method: Standard Method

alysis
BDL
BDL
BDL
BDL
BDL
BDL
1.1
BDL

"Precision, Accuracy and Service" -

Project #: 920476 Page 2 of 16

Sample ID: B-130

TCLP METALS

Method: Standard Method

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.1	BDL
Chromium	0.1	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver .	0.1	BDL
Barium	0.1	1.1
Mercury	0.05	BDL

Project #: 920476 Page 3 of 16

Sample ID: B-129

Method:	Standard	Methods

	MDL (mg/Kg)	<u>Analysis</u>
Paint Filter:		PASS
Acid Compatability:		Slight foaming
Base Compatability:		No Reaction
Water Compatability:		No Reaction
pH: (10% solution)		8.7
Open Cup Flashpoint:		>200 ⁰ F
Total Cyanide:	0.5	BDL
Reactive Cyanide:	0.5	BDL
Total Sulfide:	1.0	BDL
Reactive Sulfide:	1.0	BDL
Total Phenols:	2.5	BDL
EOX:	5.0	BDL
Method: GC/ECD		

Analysis BDL MDL (mg/Kg) PCBs: 0.5

TCLP METALS

Method: Standard Method

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.1	BDL
Chromium	0.1	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.1	BDL
Barium	0.1	0.2
Mercury	0.05	BDL

Project #: 920476 Page 4 of 16

Sample ID: B-129 (cont'd)

T-SERIES

Method: SW-846 8240 (modified to capillary).

	MDL (mg/Kg)	Analysis (mg/Kg)
Acetone	0.10	BDL
Benzene	0.010	BDL
Carbon Tetrachloride	0.010	BDL
Carbon Disulfide	0.010	BDL
Chlorobenzene .	0.010	BDL
ortho-Dichlorobenzene	0.010	BDL
Ethylbenzene	0.010	BDL
Ethyl ether	0.050	BDL
Isobutanol	0.075	BDL
Methylene Chloride	0.050	BDL
MEK (2-Butanone)	0.075	BDL
MIBK	0.050	BDL
Tetrachloroethylene	0.010	BDL
Toluene	0.010	BDL
111-Trichloroethane	0.010	BDL
112-Trichloroethane	0.010	BDL
Trichloroethylene	0.010	BDL
112-Trichloro-122-		
Trifluoroethane	0.010	BDL
Trichlorofluoromethane	0.010	BDL
Xylenes	0.025	BDL
P-SERIES SEMI-VOA'S Method: SW-846 8270		
n-butyl Alcohol	1.0	BDL
Cresols	1.0	BDL
Cyclohexanone	1.0	BDL
2-Ethoxyethanol	1.0	BDL
Ethyl acetate	1.0	BDL
Nitrobenzene	1.0	BDL
2-Nitropropane	1.0	BDL
Pyridine	1.0	BDL
Method: GC/FID		
Methanol	1.0	BDL

Project #: 920476 Page 5 of 16

Sample ID: B-129 (cont'd)

	(modified to capillary).	20020 10 40 40
Parameter	MDL (mg/L)	Analysis (mg/L)
Benzene	0.005	BDL
Carbon tetrachloride	0.005	BDL
Chlorobenzene	0.005	BDL
Chloroform	0.005	BDL
1,2-Dichloroethane	0.005	BDL
1,1-Dichloroethylene	0.005	BDL
Methyl ethyl ketone	0.25	BDL
Tetrachloroethylene	0.005	BDL
Trichloroethylene	0.005	BDL
Vinyl chloride	0.005	BDL
TCLP ACID EXTRACTABLE Method: 8W-846 8270		
Parameter	MDL (mg/L)	Analysis (mg/L)
o-Cresol	0.05	BDL
m & p-Cresol	0.05	BDL
Pentachlorophenol	0.05	BDL
2,4,5-Trichlorophenol	0.05	BDL
2,4,6-Trichlorophenol	0.05	BDL
TCLP BASE/NEUTRALS Method: SW-846 8270		
Parameter	MDL (mg/L)	Analysis (mg/L)
1,4-Dichlorobenzene	0.05	BDL
2,4-Dinitrotoluene	0.05	BDL
Hexachloroethane	0.05	BDL
Hexachlorobutadiene	0.05	BDL
Hexachlorobenzene	0.05	BDL
Nitrobenzene	0.05	BDL
Pyridine	0.05	BDL

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Sample ID: B-131

Method:	Standard Methods		
		MDL (mg/Kg)	<u>Analysis</u>
Paint Fi	lter:		PASS
	patability:		No Reaction
	patability:		No Reaction
	mpatability:		No Reaction
	(10% solution)		8.6 >200 ⁰ F
	Flashpoint:		
Total Cy		0.5	BDL
	Cyanide:	0.5	BDL
Total Su		1.0	BDL
	Sulfide:	1.0	BDL
Total Ph	enols:	2.5	BDL
EOX:		5.0	BDL
Method:	GC/ECD		
	•	MDL (mg/Kg)	Analysis
PCBs:		0.5	BDL
TCLP MET	2 1.9		
Method:			
Mechod.	pressure Wernor		
Paramete	r	MDL (mg/L)	Analysis (mg/L)
3		0.0	BDL
Arsenic		0.2	BDL
Cadmium		0.1	
Chromium		0.1	BDL
Lead		0.1	BDL
Selenium		0.2	BDL
Silver		0.1	BDL
Barium		0.1	0.1
			_
Mercury		0.05	BDL

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Sample ID: B-131 (cont'd)

F-SERIES

Method: SW-846 8240 (modified to capillary).

Acetone 0.10 BDL Benzene 0.010 BDL Carbon Tetrachloride 0.010 BDL Carbon Disulfide 0.010 BDL Chlorobenzene 0.010 BDL ortho-Dichlorobenzene 0.010 BDL Ethylbenzene 0.010 BDL Ethyl ether 0.050 BDL Isobutanol 0.075 BDL Methylene Chloride 0.050 BDL MEK (2-Butanone) 0.075 BDL MIBK 0.050 BDL Tetrachloroethylene 0.010 BDL
Benzene 0.010 BDL Carbon Tetrachloride 0.010 BDL Carbon Disulfide 0.010 BDL Chlorobenzene 0.010 BDL ortho-Dichlorobenzene 0.010 BDL Ethylbenzene 0.010 BDL Ethyl ether 0.050 BDL Isobutanol 0.075 BDL Methylene Chloride 0.050 BDL MEK (2-Butanone) 0.075 BDL MIBK 0.050 BDL Tetrachloroethylene 0.010 BDL
Carbon Tetrachloride 0.010 BDL Carbon Disulfide 0.010 BDL Chlorobenzene 0.010 BDL ortho-Dichlorobenzene 0.010 BDL Ethylbenzene 0.010 BDL Ethyl ether 0.050 BDL Isobutanol 0.075 BDL Methylene Chloride 0.050 BDL MEK (2-Butanone) 0.075 BDL MIBK 0.050 BDL Tetrachloroethylene 0.010 BDL
Carbon Disulfide 0.010 BDL Chlorobenzene 0.010 BDL ortho-Dichlorobenzene 0.010 BDL Ethylbenzene 0.010 BDL Ethyl ether 0.050 BDL Isobutanol 0.075 BDL Methylene Chloride 0.050 BDL MEK (2-Butanone) 0.075 BDL MIBK 0.050 BDL Tetrachloroethylene 0.010 BDL
Chlorobenzene 0.010 BDL ortho-Dichlorobenzene 0.010 BDL Ethylbenzene 0.010 BDL Ethyl ether 0.050 BDL Isobutanol 0.075 BDL Methylene Chloride 0.050 BDL MEK (2-Butanone) 0.075 BDL MIBK 0.050 BDL Tetrachloroethylene 0.010 BDL
ortho-Dichlorobenzene 0.010 BDL Ethylbenzene 0.010 BDL Ethyl ether 0.050 BDL Isobutanol 0.075 BDL Methylene Chloride 0.050 BDL MEK (2-Butanone) 0.075 BDL MIBK 0.050 BDL Tetrachloroethylene 0.010 BDL
Ethylbenzene 0.010 BDL Ethyl ether 0.050 BDL Isobutanol 0.075 BDL Methylene Chloride 0.050 BDL MEK (2-Butanone) 0.075 BDL MIBK 0.050 BDL Tetrachloroethylene 0.010 BDL
Ethyl ether 0.050 BDL Isobutanol 0.075 BDL Methylene Chloride 0.050 BDL MEK (2-Butanone) 0.075 BDL MIBK 0.050 BDL Tetrachloroethylene 0.010 BDL
Isobutanol0.075BDLMethylene Chloride0.050BDLMEK (2-Butanone)0.075BDLMIBK0.050BDLTetrachloroethylene0.010BDL
MEK (2-Butanone)0.075BDLMIBK0.050BDLTetrachloroethylene0.010BDL
MIBK 0.050 BDL Tetrachloroethylene 0.010 BDL
Tetrachloroethylene 0.010 BDL

Toluene 0.010 BDL
111-Trichloroethane 0.010 BDL
112-Trichloroethane 0.010 BDL
Trichloroethylene 0.010 BDL
112-Trichloro-122-
Trifluoroethane 0.010 BDL
Trichlorofluoromethane 0.010 BDL
Xylenes 0.025 BDL
P-SERIES SEMI-VOX'S Method: SW-846 8270
n-butyl Alcohol 1.0 BDL
Cresols 1.0 BDL
Cyclohexanone 1.0 BDL
2-Ethoxyethanol 1.0 BDL
Ethyl acetate 1.0 BDL
Nitrobenzene 1.0 BDL
2-Nitropropane 1.0 BDL
Pyridine 1.0 BDL
Method: GC/FID
Methanol 1.0 BDL

Sample ID: B-131 (cont'd)

TCLP VOLATILES Nethod: SW-846 8240 (mod Parameter	dified to capillary). MDL (mg/L)	Analysis	(mg/L)
9		557	
Benzene	0.005	BDL	
Carbon tetrachloride	0.005	BDL	
Chlorobenzene	0.005	BDL	
Chloroform	0.005	BDL	
1,2-Dichloroethane	0.005	BDL BDL	
1,1-Dichloroethylene Methyl ethyl ketone	0.005	BDL	
Tetrachloroethylene	0.25	BDL	
Trichloroethylene	0.005 0.005	BDL	
Vinyl chloride	0.005	BDL	
Vinyi chioride	0.005	שטם	
TCLP ACID EXTRACTABLES Method: SW-846 8270			
Parameter	MDL (mg/L)	Analysis	(mg/L)
	0.05	201	
o-Cresol	0.05	BDL	
m & p-Cresol	0.05	BDL	
Pentachlorophenol	0.05	BDL	
2,4,5-Trichlorophenol	0.05	BDL	
2,4,6-Trichlorophenol	0.05	BDL	
TCLP BASE/NEUTRALS Method: SW-846 8270 Parameter	MDL (mg/L)	Analysis	(mg/L)
	(3,,		, -,
1,4-Dichlorobenzene	0.05	BDL	
2,4-Dinitrotoluene	0.05	BDL	
Hexachloroethane	0.05	BDL	•
Hexachlorobutadiene	0.05	BDL	
Hexachlorobenzene	0.05	BDL	
Nitrobenzene	0.05	BDL	
Pyridine	0.05	BDL	
•			

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Volatiles	Method:	8W-846	8240	(Modified to	capillary)
Parameter				MDL	Analysis
				mg/L	mg/L
9 9-56-53-				0.000	200
1,1-Dichlo				0.001	
1,1-Dichlo				0.001	
1,1,1-Tric 1,1,2-Tric				0.001	
1,1,2-1110 1,1,2,2-Te				0.003	
1,2-Dichlo		echane		0.00	
1,2-Dichlo				0.00	
1,2-Dienio					
				0.001 0.001	
1,4-Dichlo		ne		0.05	
2-Butanone 2-Chloroet		othor		0.00	
2-Hexanone		erner		0.01	
4-Methyl-2		A/MTRV\		0.005	
Acetone	-bencanon	e (HIDA)		0.07	
Acrolein				0.10	
Acrylonitr	ile			0.10	BDL
Benzene	776			0.001	
Bromodichl	oromethan	_		0.00	
Bromometha		-		0.00	
Carbon dis				0.00	
Chlorobenz				0.001	
Chloroetha				0.005	
Chlorometh				0.005	
cis-1,3-Di		nene		0.003	
Dibromochl				0.003	
Dibromomet				0.00	
Dichlorodi		hane		0.003	
Ethylbenze				0.00	
Iodomethan				0.00	
Methylbenz		uene)		0.00	
Methylene		,		0.00	
Styrene				0.003	
Tetrachlor	oethene			0.00	
Tetrachlor	omethane			0.00	BDL BDL
trans-1,2-				0.00	BDL
trans-1,3-	Dichlorop	ropene		0.003	BDL
Tribromome)	0.00	BDL BDL
Trichloroe		•		0.00	
Trichlorof				0.00	L BDL
Trichlorom		hlorofo	cm)	0.00	
Vinyl acet			=	0.029	
Vinyl chlo				0.005	
Xylenes (T	otal)			0.003	BDL

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VOLATILES	Method:	SW-846	8240	(Modified to	capillary)	
Parameter				MDL	Analysis	5
. 42 42.0 000				mg/L	mg/L	
				.		
1,1-Dichlo	roethane			0.00	L BDL	
1,1-Dichlo	roethene			0.00	BDL BDL	
1,1,1-Tric		ne		0.00	BDL BDL	
1,1,2-Tric	hloroetha	ne		0.00	L BDL	
1,1,2,2-Te	trachloro	ethane		0.00	l BDL	
1,2-Dichlo	roethane			0.00	·-	
1,2-Dichlo	ropropane			0.00		
1,2,3-Tric				0.00	l BDL	
1,4-Dichlo	ro-2-bute	ne		0.00		
2-Butanone	(MEK)			0.05		
2-Chloroet	hyl vinyl	ether		0.00		
2-Hexanone	· -			0.01	D BDL	
4-Methyl-2	-pentanon	e(MIBK)		0.00	5 BDL	
Acetone	_			0.07	5 BDL	
Acrolein				0.10	BDL	
Acrylonitr	ile			0.10	BDL	
Benzene				0.00		
Bromodichl	oromethan	e		0.00		
Bromometha	ne			0.00	5 BDL	
Carbon dis				0.00	1 BDL	
Chlorobenz	ene			0.00	l BDL	
Chloroetha	ne			0.00	5 BDL	
Chlorometh	ane			0.00	5 BDL	
cis-1,3-Di	chloropro	pene		0.00	1 BDL	
Dibromochl		ne		0.00		
Dibromomet				0.00		
Dichlorodi		hane		0.00		
Ethylbenze				0.00		
Iodomethan				0.00		
Methylbenz		uene)		0.00		
Methylene	chloride			0.00	_	
Styrene				0.00		
Tetrachlor				0.00		
Tetrachlor				0.00		
trans-1,2-				0.00		
trans-1,3-				0.00		
Tribromome		omoform:)	0.00		
Trichloroe				0.00		
Trichlorof				0.00		
Trichlorom		hlorofo	rm)	0.00		
Vinyl acet				0.02		
Vinyl chlo				0.00		
Xylenes (T	Cotal)			0.00	3 BDL	

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VOLATILES	Method:	SW-846	8240	(Modified to	capillary)
Parameter				MDL	Analysis
				mg/L	mg/L
1 4 9:->1-					
1,1-Dichlo				0.01	BDL
1,1-Dichlo				0.01	BDL
1,1,1-Tric 1,1,2-Tric				0.01	BDL
1,1,2,2-Te	trachloro	etpano ne		0.01 0.01	BDL
1,2-Dichlo		ecnane		0.01	BDL BDL
1,2-Dichlo				0.01	BDL
1,2,3-Tric	hloropane	270		0.01	BDL
1,4-Dichlo				0.01	BDL
2-Butanone				0.50	BDL
2-Chloroet		ether		0.01	BDL
2-Hexanone				0.10	BDL
4-Methyl-2	-pentanon	e(MIBK)		0.05	
Acetone	•	- (,		0.75	BDL
Acrolein				1.0	BDL
Acrylonitr	ile			1.0	BDL
Benzene				0.01	BDL
Bromodichl	oromethan	e		0.01	BDL
Bromometha	ne			0.05	BDL
Carbon dis				0.01	BDL
Chlorobenz	ene			0.01	BDL
Chloroetha	ne			0.05	BDL
Chlorometh				0.05	BDL
cis-1,3-Di	chloropro	pene		0.01	BDL
Dibromochl		ne		0.01	BDL
Dibromomet				0.01	BDL
Dichlorodi		hane		0.01	BDL
Ethylbenze				0.01	BDL
Iodomethan				0.01	BDL
Methylbenz		uene)		0.01	0.13
Methylene	chloride			0.01	BDL
Styrene	- 43			0.01	BDL
Tetrachlor				0.02	BDL
Tetrachlor				0.01	BDL
trans-1,2-				0.01	BDL
trans-1,3-				0.01	BDL
Tribromome		omoiorm)		0.01	BDL
Trichloroe				0.01	BDL
Trichlorof				0.01	BDL
Trichlorome Vinyl aceta	etnane (Ci	JOTOFOL	TA)	0.01	BDL
Vinyl acet				0.25	BDL
				0.05	BDL
Xylenes (To	eraT)			0.03	0.31

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VOLATILES Method: SW-846 8240 (Modified to capillary) Analysis mg/L 1,1-Dichloroethane 0.001 BDL 1,1-Dichloroethane 0.001 BDL 1,1,1-Trichloroethane 0.001 BDL 1,1,2-Trichloroethane 0.001 BDL 1,2,2,2-Tetrachloroethane 0.001 BDL 1,2-Dichloroethane 0.001 BDL 1,2-Trichloropropane 0.001 BDL 1,2-Trichloropropane 0.001 BDL 1,2-Trichloropropane 0.001 BDL 1,4-Dichloro-2-butene 0.001 BDL 2-Butanone (MEK) 0.050 BDL 2-Chloroethyl vinyl ether 0.001 BDL 2-Hexanone 0.010 BDL Acrolein 0.005 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Carbon disulfide 0.001 BDL
1,1-Dichloroethane
1,1-Dichloroethene
1,1-Dichloroethene
1,1,1-Trichloroethane 0.001 BDL 1,1,2-Trichloroethane 0.001 BDL 1,1,2,2-Tetrachloroethane 0.001 BDL 1,2-Dichloroethane 0.001 BDL 1,2-Dichloropropane 0.001 BDL 1,2,3-Trichloropropane 0.001 BDL 1,4-Dichloro-2-butene 0.001 BDL 2-Butanone (MEK) 0.050 BDL 2-Chloroethyl vinyl ether 0.001 BDL 2-Hexanone 0.010 BDL 4-Methyl-2-pentanone (MIBK) 0.005 BDL Acrolein 0.005 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.005 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.001 BDL Dibromochloroemethane 0.001 BDL
1,1,2-Trichloroethane 0.001 BDL 1,1,2,2-Tetrachloroethane 0.001 BDL 1,2-Dichloroethane 0.001 BDL 1,2-Dichloropropane 0.001 BDL 1,2,3-Trichloropropane 0.001 BDL 1,4-Dichloro-2-butene 0.001 BDL 2-Butanone (MEK) 0.050 BDL 2-Chloroethyl vinyl ether 0.001 BDL 2-Hexanone 0.001 BDL 4-Methyl-2-pentanone (MIBK) 0.005 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Dibromochloroemethane 0.001 BDL Dibromochloroemethane 0.001 BDL
1,1,2,2-Tetrachloroethane 1,2-Dichloroethane 1,2-Dichloropropane 1,2,3-Trichloropropane 1,4-Dichloro-2-butene 2-Butanone (MEK) 2-Chloroethyl vinyl ether 2-Hexanone 4-Methyl-2-pentanone (MIBK) Acctone Acrolein Acrylonitrile Bromodichloromethane Bromomethane Carbon disulfide Chloroethane Chloroethane Chloroethane Chloroethane Chloromethane Chloromethane Chloromethane Chloromethane Chloromethane Cis-1,3-Dichloropropene Dibromochloroemethane Could Chloromethane Chloromethane Could Chloromethane Could Chloromethane Could Chloromethane Could Chlo
1,2-Dichloroethane 0.001 BDL 1,2-Dichloropropane 0.001 BDL 1,2,3-Trichloropropane 0.001 BDL 1,4-Dichloro-2-butene 0.001 BDL 2-Butanone (MEK) 0.050 BDL 2-Chloroethyl vinyl ether 0.001 BDL 2-Hexanone 0.010 BDL 4-Methyl-2-pentanone (MIBK) 0.005 BDL Acetone 0.075 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Bromomethane 0.001 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloroethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Dibromochloroemethane 0.001 BDL
1,2-Dichloropropane 0.001 BDL 1,2,3-Trichloropropane 0.001 BDL 1,4-Dichloro-2-butene 0.001 BDL 2-Butanone (MEK) 0.050 BDL 2-Chloroethyl vinyl ether 0.001 BDL 2-Hexanone 0.010 BDL 4-Methyl-2-pentanone (MIBK) 0.005 BDL Acetone 0.075 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.005 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Cis-1,3-Dichloropropene 0.001 BDL Dibromochloroemethane 0.001 BDL
1,2,3-Trichloropropane 0.001 BDL 1,4-Dichloro-2-butene 0.001 BDL 2-Butanone (MEK) 0.050 BDL 2-Chloroethyl vinyl ether 0.001 BDL 2-Hexanone 0.010 BDL 4-Methyl-2-pentanone (MIBK) 0.005 BDL Acetone 0.075 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Bromomethane 0.001 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Dibromochloropropene 0.001 BDL
1,4-Dichloro-2-butene 0.001 BDL 2-Butanone (MEK) 0.050 BDL 2-Chloroethyl vinyl ether 0.001 BDL 2-Hexanone 0.010 BDL 4-Methyl-2-pentanone (MIBK) 0.005 BDL Acetone 0.075 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Bromomethane 0.005 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloroethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Dibromochloroemethane 0.001 BDL
2-Butanone (MEK) 2-Chloroethyl vinyl ether 0.001 BDL 2-Hexanone 0.010 BDL 4-Methyl-2-pentanone(MIBK) 0.005 BDL Acetone 0.075 BDL Acrolein 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Bromomethane 0.005 BDL Carbon disulfide 0.001 BDL Chloroethane 0.005 BDL Chloroethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.001 BDL
2-Chloroethyl vinyl ether 0.001 BDL 2-Hexanone 0.010 BDL 4-Methyl-2-pentanone(MIBK) 0.005 BDL Acetone 0.075 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Bromomethane 0.005 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloroethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Dibromochloroemethane 0.001 BDL
2-Hexanone 4-Methyl-2-pentanone(MIBK) 0.005 BDL Acetone 0.075 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Bromomethane 0.005 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Dibromochloroemethane 0.001 BDL
4-Methyl-2-pentanone (MIBK) 0.005 BDL Acetone 0.075 BDL Acrolein 0.001 BDL Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Bromomethane 0.005 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloroethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL Dibromochloroemethane 0.001 BDL
Acetone Acrolein Acrylonitrile Benzene Bromodichloromethane Bromometha
Acrolein Acrylonitrile Benzene O.001 BDL Bromodichloromethane Bromomethane Bromomethane Bromomethane Carbon disulfide Chlorobenzene Chloroethane Chloromethane Chloromethane Chloromethane Chloromethane Chloromethane Chloromethane Chloromethane Dibromochloroemethane Dibromochloroemethane D.001 BDL Dibromochloroemethane D.001 BDL Dibromochloroemethane D.001 BDL
Acrylonitrile 0.001 BDL Benzene 0.001 BDL Bromodichloromethane 0.001 BDL Bromomethane 0.005 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloroethane 0.005 BDL Chloromethane 0.005 BDL Chloromethane 0.005 BDL cis-1,3-Dichloropropene 0.001 BDL Dibromochloroemethane 0.001 BDL
Benzene0.001BDLBromodichloromethane0.001BDLBromomethane0.005BDLCarbon disulfide0.001EDLChlorobenzene0.001BDLChloroethane0.005BDLChloromethane0.005BDLcis-1,3-Dichloropropene0.001BDLDibromochloroemethane0.001BDL
Bromodichloromethane 0.001 BDL Bromomethane 0.005 BDL Carbon disulfide 0.001 BDL Chlorobenzene 0.001 BDL Chloroethane 0.005 BDL Chloromethane 0.005 BDL cis-1,3-Dichloropropene 0.001 BDL Dibromochloroemethane 0.001 BDL
Bromomethane 0.005 BDL Carbon disulfide 0.001 EDL Chlorobenzene 0.001 BDL Chloroethane 0.005 BDL Chloromethane 0.005 BDL cis-1,3-Dichloropropene 0.001 BDL Dibromochloroemethane 0.001 BDL
Carbon disulfide0.001BDLChlorobenzene0.001BDLChloroethane0.005BDLChloromethane0.005BDLcis-1,3-Dichloropropene0.001BDLDibromochloroemethane0.001BDL
Chlorobenzene 0.001 BDL Chloroethane 0.005 BDL Chloromethane 0.005 BDL cis-1,3-Dichloropropene 0.001 BDL Dibromochloroemethane 0.001 BDL
Chloroethane0.005BDLChloromethane0.005BDLcis-1,3-Dichloropropene0.001BDLDibromochloroemethane0.001BDL
Chloromethane 0.005 BDL cis-1,3-Dichloropropene 0.001 BDL Dibromochloroemethane 0.001 BDL
cis-1,3-Dichloropropene 0.001 BDL Dibromochloroemethane 0.001 BDL
Dibromochloroemethane 0.001 BDL
14 1 14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Dichlorodifluoromethane 0.001 BDL
Ethylbenzene 0.001 BDL
Iodomethane 0.001 BDL
Methylbenzene (Toluene) 0.001 BDL
Methylene chloride 0.001 BDL
Styrene 0.001 BDL
Tetrachloroethene 0.001 BDL
Tetrachloromethane 0.001 BDL
trans-1,2-Dichloroethene 0.001 BDL
trans-1,3-Dichloropropene 0.001 BDL
Tribromomethane (Bromoform) 0.001 BDL
Trichloroethene 0.001 BDL
Trichlorofluoromethane 0.001 0.74
Trichloromethane (Chloroform) 0.001 BDL
Vinyl acetate 0.025 BDL
Vinyl chloride 0.005 BDL
Xylenes (Total) 0.003 BDL

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Sample ID: MW-128 (cont'd)

PNA's Parameter	Method: 8W-846 8310 MDL (mg/L)	Analysis (mg/L)
Acenaphthene	0.010	BDL BDL
Acenaphthylene Anthracene	0.010 0.0066	BDL 0.00095
Benzo(a) anthracene Benzo(a) pyrene	0.00010 0.00020 0.00018	0.00097 BDL
Benzo(b) fluoranthene Benzo(ghi) perylene Benzo(k) fluoranthene	0.00018 0.00076 0.00017	BDL BDL
Chrysene Dibenzo(a,h)anthracene	0.0017 0.0015 0.00030	BDL BDL
Fluoranthene Fluorene	0.0020	0.0021 BDL
Ideno(1,2,3-c,d)pyrene Naphthalene	0.0020 0.0040 0.010	BDL BDL
Phenanthrene Pyrene	0.0060 0.0027	BDL BDL

Sample ID: MW-129 (cont'd)

PNA's	Method: 8W-846 8310	
Parameter	MDL (mg/L)	Analysis (mg/L)
Acenaphthene	0.010	BDL
Acenaphthylene	0.010	BDL
Anthracene	0.0066	BDL
Benzo(a)anthracene	0.00010	BDL
Benzo(a)pyrene	0.00020	BDL
Benzo(b) fluoranthene	0.00018	BDL
Benzo(ghi)perylene	0.00076	BDL
Benzo(k) fluoranthene	0.00017	BDL
Chrysene	0.0015	BDL
Dibenzo(a,h)anthracene	0.00030	BDL
Fluoranthene	0.0020	BDL
Fluorene	0.0020	BDL
Ideno(1,2,3-c,d)pyrene	0.00040	BDL
Naphthalene	0.010	BDL '
Phenanthrene	0.0060	BDL
Pyrene	0.0027	BDL

Sample ID: MW-130 (cont'd)

PNA's	Method: SW-846 8310	
Parameter	MDL (mg/L)	Analysis (mg/L)
Acenaphthene	0.10	BDL
Acenaphthylene	0.10	BDL
Anthracene	0.066	BDL
Benzo(a) anthracene	0.0010	BDL
Benzo(a)pyrene	0.0020	BDL
Benzo(b) fluoranthene	0.0018	BDL
Benzo(ghi)perylene	0.0076	BDL
Benzo(k) fluoranthene	0.0017	BDL
Chrysene .	0.015	BDL
Dibenzo(a,h)anthracene	0.0030	BDL
Fluoranthene	0.020	BDL
Fluorene	0.020	BDL
Ideno(1,2,3-c,d)pyrene	0.0040	BDL
Naphthalene	0.10	0.37
Phenanthrene	0.060	0.087
Pyrene	0.027	BDL

Sample ID: MW-131 (cont'd)

PNA's	Method: SW-846 8310	
Parameter	MDL (mg/L)	Analysis (mg/L)
Acenaphthene	0.010	BDL
Acenaphthylene	0.010	BDL
Anthracene	0.0066	BDL
Benzo(a) anthracene	0.00010	0.00019
Benzo(a) pyrene	0.00020	0.00024
Benzo(b) fluoranthene	0.00018	BDL
Benzo(ghi)perylene	0.00076	BDL
Benzo(k)fluoranthene	0.00017	BDL
Chrysene	0.0015	BDL
Dibenzo(a,h)anthracene	0.00030	BDL
Fluoranthene	0.0020	BDL
Fluorene	0.0020	BDL
Ideno(1,2,3-c,d)pyrene	0.00040	BDL
Naphthalene	0.010	BDL
Phenanthrene	0.0060	BDL
Pyrene	0.0027	BDL

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Sample ID: MW-128 (cont'd)

TOTAL METALS

Method: Standard Methods

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.05	BDL
Chromium	0.05	BDL
Lead	0.1	0.5
Selenium	0.2	BDL
Silver	0.05	BDL
Barium	0.05	0.33
Mercury	0.005	BDL

Sample ID: MW-129 (cont'd)

TOTAL METALS

Method: Standard Methods

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.05	BDL
Chromium	0.05	BDL
Lead	0.1	BDL
Selenium	0.2	BDL
Silver	0.05	BDL
Barium	0.05	0.21
Mercury	0.005	BDL

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TO

Sample ID: MW-130 (cont'd)

TOTAL METALS

Method: Standard Methods

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.05	BDL
Chromium	0.05	0.06
Lead	0.1	1.8
Selenium	0.2	BDL
Silver	0.05	BDL
Barium	0.05	0.29
Mercury	0.005	BDL

Sample ID: MW-131 (cont'd)

TOTAL METALS

Method: Standard Methods

Parameter	MDL (mg/L)	Analysis (mg/L)
Arsenic	0.2	BDL
Cadmium	0.05	BDL
Chromium	0.05	BDL
Lead	0.1	2.9
Selenium	0.2	BDL
Silver	0.05	BDL
Barium	0.05	0.14
Mercury	0.005	BDL

PCBs/Liquid Method: GC/ECD

Sample ID: (cont'd)	MDL (mg/L)	Analysis (mq/L)
MW-128	0.02	BDL
MW-129	0.02	BDL
MW-130	0.02	BDL
MW-131	0.02	BDL

MDL = Method Detection Limit
BDL = Below Detection Limit

Respectfully submitted,

Nicholas Cuzdone

Lab Manager

Quality Analytical Labs, Inc.

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RADIOACTIVE PROJECT EXPERIENCE



Confidential Client

Assessment of Hazardous Solid Waste Storage Risk

A nuclear fuel processing plant had treated low level radioactive waste by solidification and storage in steel drums. After a short period of time a number of the drums showed a substantial degree of swelling, and in view of the nature of the contents, the owners asked STS to determine the nature and condition of the contents prior to opening the drums.

Using a combination of dynamic and mechanical tests, STS was able to prove that the waste had not reliquified, and there was a very low risk of gas pressure build-up in the drums. The drums were then successfully opened with no spillage or gas release, confirming STS' analysis that the swelling was caused by uneven expansion of the solidification agent, probably caused by incomplete mixing.

Fermi National Laboratory Tritium Contaminated Water Sampling Batavia, Illinois

STS participated in the design, installation and sampling of a series of groundwater monitoring wells to explore for a potential release of tritium-enriched water at Fermi National Laboratory. The wells were installed at an angle, to facilitate sampling of a drainage system beneath the radiation source which had been installed to collect and contain any releases which might occur. Precise location and alignment specifications were required and complied with. Drilling methods required that no water be introduced, in order to minimize the potential dilution of the tritiated water which may have been present, and to constrain any migration. All equipment used was monitored for potential radiation contamination and was decontaminated before removal from the site. Samples were collected by STS personnel using dedicated sampling equipment to avoid potential cross contamination. Analysis was conducted at a subcontracted laboratory selected by Fermi Lab representatives.

Kerr-McGee Corporation Radioactive Contamination Assessment West Chicago, Illinois

STS was retained for a hydrogeological assessment of the firm's West Chicago processing facility. Contamination of a down-gradient municipal well prompted officials to institute a source evaluation for the contamination. STS' scope of services included a remedial investigation of the site. The facility which was formerly used as a uranium processing plant contained numerous waste tailing piles which were determined to be leaching low level radionuclei and volatile organic compounds into the groundwater. The investigation scope included the installation of over 40 stainless steel groundwater monitoring wells to determine groundwater flow direction and horizontal and vertical gradients. STS conducted extensive sampling to determine levels of contamination for contaminants. STS performed over 1220 soil borings for soil sampling and chemical analysis to define the extent of near surface and deep aquifer consideration. contamination. STS also conducted an extensive geophysical exploration program including resistivity soundings and profiling, electromagnetic inductance and ground penetrating radar surveys. STS performed extensive groundwater flow and solute transport modeling to predict steady state contamination transport using a variety of scenarios. STS' modeling indicated that the leaching of the waste tailings had contaminated the underlying groundwater table. The contaminants had migrated over time to the groundwater supplies of the downgradient municipalities. STS crews worked under an exhaustive health and safety program developed by STS and Kerr-McGee,

Institute of Paper Science and Technology Appleton, Wisconsin

STS conducted a subsurface exploration for the recovery of previously disposed radioactive tracer chemicals. Small quantities of Promethium-147, Silver-110, Carbon-14 and Tritium were disposed at the IPST facility in 1979. STS was contracted to locate and remove the materials which were reportedly disposed of in a container.

STS conducted a series of site surveys including Electromagnetic(EM), Ground Penetrating Radar(GPR) and a radiation survey using a Geiger-Mueller Radiation Survey Meter. Subsequent exploration included test pit trenching of identified target areas.

The materials disposed were reportedly exempt from regulation due to the small quantities, and were proposed to be removed as part of a real estate sale under consideration.